Dell Precision™ Workstations 450 and 650

User's Guide

This document describes the features and operation of your computer. This document is stored on your computer hard drive. For information on other documentation included with your computer, see "Finding Information for Your Computer."

Notes, Notices, and Cautions

NOTE: A NOTE indicates important information that helps you make better use of your computer.

NOTICE: A NOTICE indicates either potential damage to hardware or loss of data and tells you how to avoid the problem.

CAUTION: A CAUTION indicates a potential for property damage, personal injury, or death.

Abbreviations and Acronyms

For a complete list of abbreviations and acronyms, see the Glossary.

If you purchased a Dell™ n Series computer, any references in this document to Microsoft® Windows® operating systems are not applicable.

Models: WHL and WHM

April 2003 P/N 6T345 Rev. A03

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4 Advanced Features

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SECTION 2

Information About Your Computer

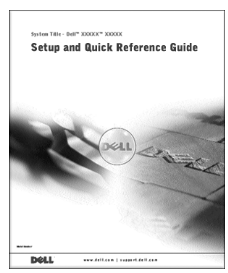
Finding Information for Your Computer

What Are You Looking For?	Find it Here
• A diagnostic program for my computer • Drivers for my computer • My *User's Guide* • My device documentation	**Drivers and Utilities CD (also know as the ResourceCD)**



You can use this CD to access documentation, reinstall drivers, or run diagnostics tools.

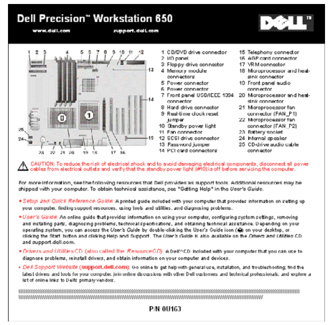
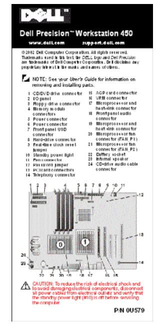
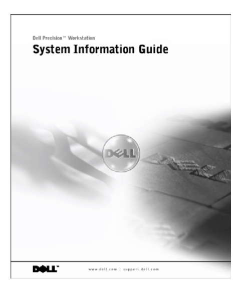
What Are You Looking For?	Find it Here
• How to set up my computer • How to care for my computer • Troubleshooting information • How to open my computer cover • How to locate other documentation	**Setup and Quick Reference Guide**



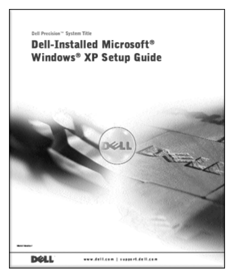
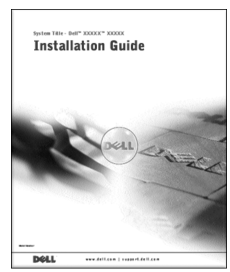
What Are You Looking For?	Find it Here
• Express Service Code and Service Tag Number • Microsoft® Windows® License Label	**Express Service Code and Product Key**



Located on your computer.

What Are You Looking For?	Find it Here
• System board connectors • Location of system board components	**System Information Label**  or  Located on the inside cover of your computer.
• How to remove and replace parts • Technical specifications • How to configure system settings • How to troubleshoot and solve problems	**User's Guide Icon (Microsoft Windows 2000)**  Double-click the **User's Guides** icon on your desktop. **Windows XP Help and Support Center** **1** Click the **Start** button, and click **Help and Support**. **2** Click **User's Guide**.
• Warranty Information	**System Information Guide** 

What Are You Looking For?	Find it Here
• Latest drivers for my computer • Answers to technical service and support questions • Online discussions with other users and technical support • Documentation for my computer including the *Service Manual*	**Dell Support Website — support.dell.com** The Dell Support website provides several online tools, including: • Knowledge Base — hints, tips, and online courses • Customer Forum — online discussion with other Dell customers • Upgrades — upgrade information for components, such as memory, the hard drive, and the operating system • Customer Care — contact information, order status, warranty, and repair information • Downloads — drivers, patches, and software updates • Reference — computer documentation, product specifications, and white papers
• Service call status and support history • Top technical issues for my computer • Frequently asked questions • File downloads • Details on my computer's configuration • Service contract for my computer	**Dell Premier Support Website — premiersupport.dell.com** The Dell Premier Support website is customized for corporate, government, and education customers. This site may not be available in all regions.

What Are You Looking For?	Find it Here
• How to reinstall my operating system	**Operating System CD and Installation Guide**  or  After you reinstall your operating system, use the *Drivers and Utilities* CD to reinstall drivers for the devices that came with your computer.  
• How to use Windows XP • Documentation for my computer and devices	**Windows XP Help and Support Center** 1 Click the **Start** button, and then click **Help and Support**. 2 Type a word or phrase that describes your problem, and then click the arrow icon. 3 Click the topic that describes your problem. 4 Follow the instructions shown on the screen. **NOTE:** For help using Windows 2000, click the **Start** button and click **Help**.

Specifications

Microprocessor	
Microprocessor type	Intel® Xeon™
Level 1 (L1) cache	8 KB
Level 2 (L2) cache	512-KB

Memory	
Type	PC2100 DDR
Memory connectors	four
Memory capacities	256-, 512-MB, and 1-GB non-ECC or ECC
Minimum memory	256 MB
Maximum memory	4 GB
BIOS address	F0000h

Computer Information	
Chip set	Intel E7505
Data bus width	64 bits
Address bus width	32 bits
DMA channels	8
Interrupt levels	23
BIOS chip	4-Mb
Memory speed	266 MHz DDR (PC 2100 DDR)

Computer Information	
NIC	Gigabit integrated network interface with ASF support as defined by DMTF Capable of 10/100/1000 communication • Green — A good connection exists between a 10-Mbps network and the computer. • Orange — A good connection exists between a 100-Mbps network and the computer. • Yellow — A good connection exists between a 1 Gb (or 1000-Mbps) connection. • Off — The computer is not detecting a physical connection to the network.
SCSI controller	Dell Precision 650 computer — Integrated U320 SCSI Dell Precision 450 computer — Optional add-in U320 SCSI
FSB clock	400- or 533-MHz data rate

Video	
Type	Dell Precision 650 computer — AGP Pro 110 at 8x/4x/2x/1x (1.5 V) or PCI Dell Precision 450 computer — AGP Pro 50 at 8x/4x/2x/1x (1.5 V) or PCI

Audio	
Type	AC97, Sound Blaster emulation
Audio controller	Analog Devices Codec AD1981b
Stereo conversion	16-bit analog-to-digital; 20-bit digital-to-analog

Expansion Bus	
Bus type	Dual PCI-X 1.0 (3.3 V only), PCI 2.2 (3.3 V/5.0 V) AGP Pro 3.0 (1.5 V only)
Bus speed	PCI: 33 MHz; PCI-X: 66/100 MHz AGP Pro: 66 MHz
Expansion-card connectors:	Dell Precision 650 computer — Three PCI-X connectors, two PCI slots, and one AGP 8x Pro110 connector Dell Precision 450 computer — One PCI-X connector, two PCI slots, and one AGP 8x Pro50 connector

Drives	
Externally accessible:	
Dell Precision 650 computer	one 3.5-inch drive bay three 5.25-inch drive bays
Dell Precision 450 computer	one 3.5-inch drive bay two 5.25-inch drive bays
Internally accessible:	
Dell Precision 650 computer	three bays for three 1-inch high or two 1.6-inch high hard drives **NOTE:** You can purchase a conversion bracket from Dell that allows you to use a 5.25-inch drive bay as an additional hard drive bay.
Dell Precision 450 computer	two bays for two 1-inch high or one 1.6-inch high hard drives

Connectors	
External connectors:	
Serial	two 9-pin connectors; 16550-compatible
Parallel	one 25-hole connector (bidirectional)

Connectors	
IEEE 1394	Dell Precision 650 computer only — Two 6-pin serial connectors
Video	15-hole connector (on add-in video card)
Network connector	RJ45 connector
PS/2 (keyboard and mouse)	6-pin mini-DIN connector
USB	two USB 2.0-compliant connectors on the front panel; four USB 2.0-compliant connectors on the back panel
Audio	Dell Precision 650 computer— Three connectors for line-in, line-out, and microphone on back panel; one speaker/headphone and one microphone connector on the front panel
	Dell Precision 450 computer— Three connectors for line-in, line-out, and microphone on back panel; one speaker/headphone on the front panel
System Board Connectors:	
Primary IDE channel	40-pin connector
Secondary IDE channel	40-pin connector
Floppy drive	34-pin connector
SCSI	68-pin connector (Dell Precision 650 computer only)
CD drive audio interface	4-pin connector
Telephony (TAPI)	4-pin connector
Fans (3)	3-pin connector
I/O panel	34-pin connector
USB/IEEE 1394	16-pin connector

Key Combinations	
<F2>	starts embedded system setup (during start-up only)
<F12>	changes boot sequence (during start-up only)
<Ctrl><Alt><F10>	launches the utility partition (if installed) during computer start-up
<Ctrl><Enter>	disables computer password at start-up (after correct password is entered)

Controls and Lights	
Power control	push button
Power light	green light; blinking green in sleep state; dual-color for computer operations — green for power, yellow for diagnostics
Hard-drive access light	green
Link integrity light (on integrated network connector)	green light for 10-Mb operation; orange light for 100-Mb operation; yellow light for 1,000-Mb (1-Gb) operation
Activity light (on integrated network connector)	yellow blinking light
Diagnostic lights	four lights located on the front panel

Power	
DC power supply:	
Wattage	Dell Precision 650 computer: 460 W Dell Precision 450 computer: 360 W
Heat dissipation	Dell Precision 650 computer: 1000 BTU/hr Dell Precision 450 computer: 910 BTU/hr
Voltage	90 to 135 V at 50/60 Hz; 180 to 265 V at 50/60 Hz
Backup battery	3-V CR2032 lithium coin cell

Physical	
Dell Precision 650 computer	
Height	49.1 cm (19.3 inches)
Width	22.2 cm (8.7 inches)
Depth	48.8 cm (19.2 inches)
Weight	19 kg (42 lbs)
Dell Precision 450 computer	
Height	16.5–16.8 cm (6.5–6.6 inches)
Width	44.7 cm (17.6 inches)
Depth	44.5 cm (17.5 inches)
Weight	18.6 kg (41 lbs)
Supported monitor weight (in desktop orientation)	45.4 kg (100 lbs)

Environmental	
Temperature:	
Operating	10° to 35°C (50° to 95°F) **NOTE:** At 35°C (95°F), the maximum operating altitude is 914 m (3000 ft).
Storage	–40° to 65°C (–40° to 149°F)
Relative humidity	20% to 80% (noncondensing)
Maximum vibration:	
Operating	0.25 G at 3 to 200 Hz at 0.5 octave/min
Storage	0.5 G at 3 to 200 Hz at 1 octave/min
Maximum shock:	
Operating	bottom half-sine pulse with a change in velocity of 50.8 cm/sec (20 inches/sec)

Environmental	
Storage	Dell Precision 650 comptuer: nonoperating (half-sine pulse) 105 G, 2 ms nonoperating (faired-square wave) 27 G with a velocity change of 508 cm/sec (200 inches/sec) Dell Precision 450 computer: nonoperating (half-sine pulse) 105 G, 2 ms nonoperating (faired-square wave) 32 G wtih a velocity change of 596 cm/sec (200 inches/sec)
Altitude:	
Operating	–15 to 3048 m (–50 to 10,000 ft) **NOTE:** At 35°C (95°F), the maximum operating altitude is 914 m (3000 ft).
Storage	–15 to 10,600 m (–50 to 35,000 ft)

Caring for Your Computer

To help maintain your computer, follow these suggestions:

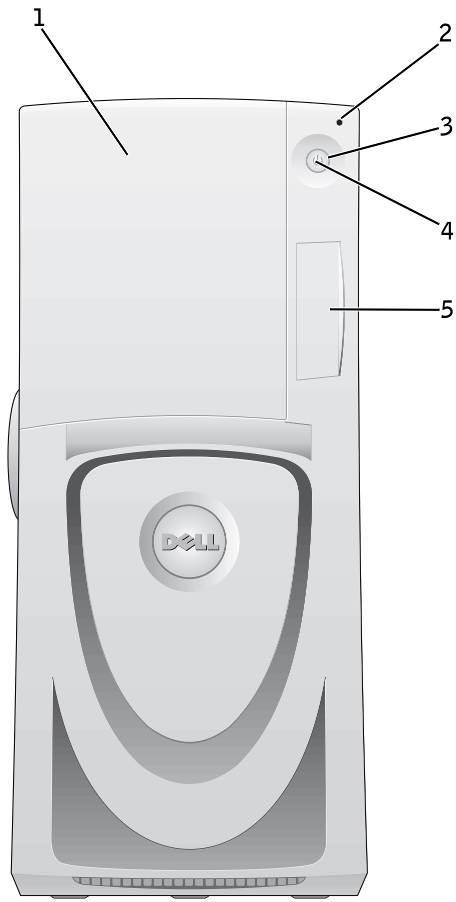
- To avoid losing or corrupting data, never turn off your computer when the hard drive light is on.
- Schedule regular virus scans using virus software.
- Manage hard drive space by periodically deleting unnecessary files and defragmenting the drive.
- Back up files on a regular basis.
- Periodically clean your monitor screen, mouse, and keyboard (see "Cleaning Your Computer").

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SECTION 3

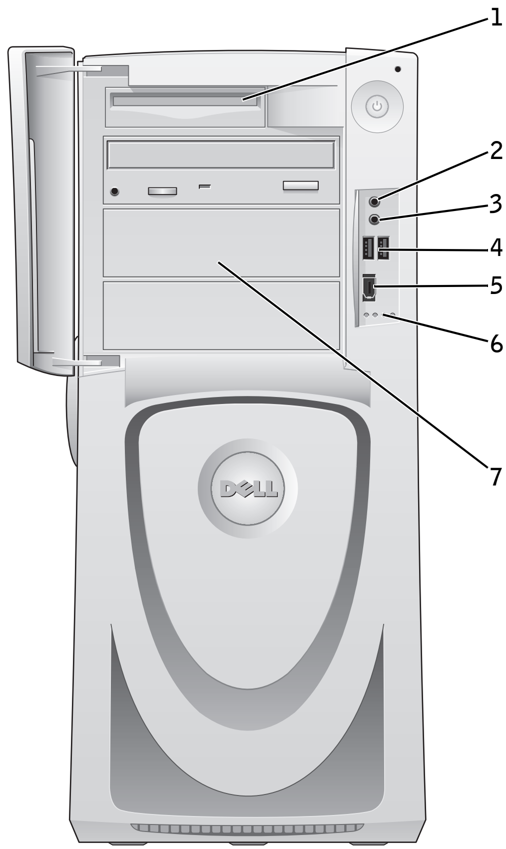
About Your Computer—Dell Precision 650

Front View



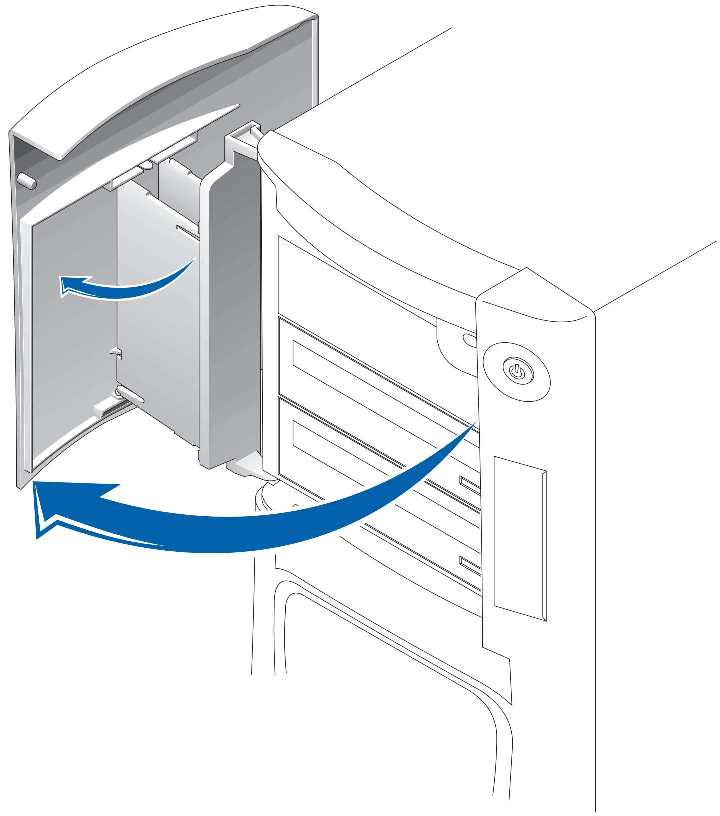
1	drive door	Open the drive door to access the floppy and CD/DVD drives.
2	hard-drive light	The hard-drive light is on when the computer reads data from or writes data to the hard drive. The light might also be on when a device such as your CD player is operating.
3	power button	Press this button to turn on the computer. **NOTICE:** To avoid losing data, do not use the power button to turn off the computer. Instead, perform a Microsoft® Windows® shutdown.
4	power light	The power light illuminates and blinks or remains solid to indicate the following different states: No light — The computer is in the off state. Steady green — The computer is in a normal operating state. Blinking green — The computer is in a power-saving state. To exit from a power-saving state, press the power button or use the keyboard or the mouse if it is configured as a wake device in the Windows Device Manager. For more information about sleep states and exiting from a power-saving state, see "Power Button." See "Diagnostic Lights" for a description of light codes that can help you troubleshoot problems with your computer.
5	front-panel door	Open the door to use the front-panel connectors.

Front View of the Computer (Doors Open)

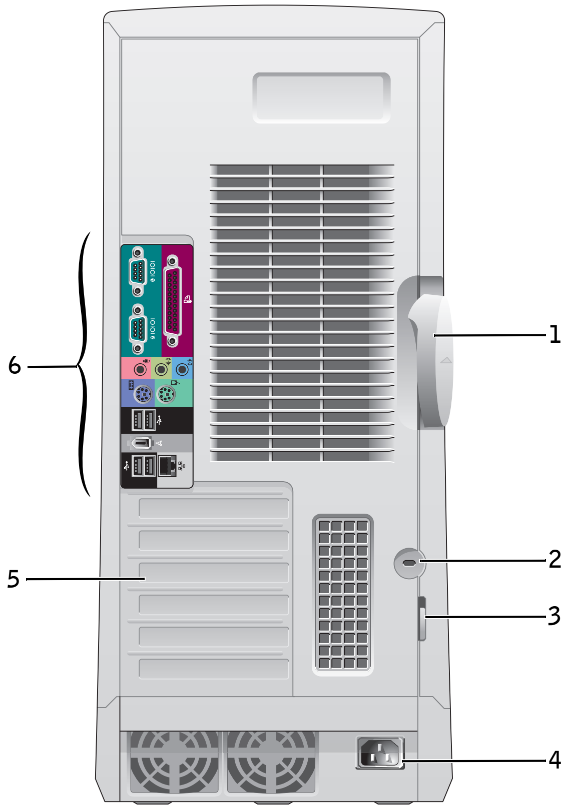


1	floppy drive	Access the floppy drive.
2	headphone connector	Attach headphones.
3	microphone connector	Attach microphone.
4	USB 2.0 connectors (2)	Use the front USB connectors for devices that you connect occasionally, such as joysticks or cameras. It is recommended that you use the back USB connectors for devices that typically remain connected, such as printers and keyboards.
5	IEEE 1394 connector	Attach high-speed serial multimedia devices, such as a digital video camera.
6	diagnostic lights (4)	Use the lights to help you troubleshoot a computer problem based on the diagnostic code. For more information, see "Diagnostic Lights."
7	externally accessible drives	Access additional drives, such as a CD or DVD drive. Drive arrangement varies on computer configuration.

Opening the Drive Door

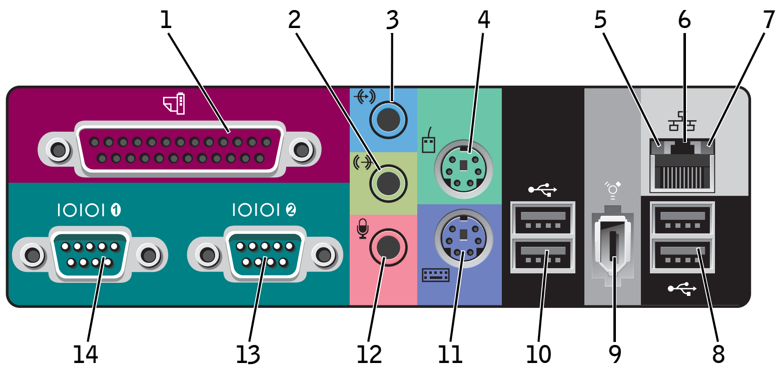


Back View



1 cover release latch		Push the latch to the left to open the computer cover.
2 security cable slot		Use a security cable with the slot to help secure your computer.
3 padlock ring		Insert a padlock to lock the computer cover.
4 power connector		Insert the power cable.
5 card slots (6)		Access connectors for any installed PCI and AGP cards.
6 back panel connectors		Plug serial, USB, and other devices into the appropriate connector.

Back Panel Connectors



1	parallel connector	Connect a parallel device, such as a printer, to the parallel connector. If you have a USB printer, plug it into a USB connector. **NOTE:** The integrated parallel connector is automatically disabled if the computer detects an installed card containing a parallel connector configured to the same address. For more information, see "System Setup Options."
2	line-out connector	Use the green line-out connector (available on computers with integrated sound) to attach headphones and speakers). On computers with a sound card, use the connector on the card.
3	line-in connector	Use the blue line-in connector (available on computers with integrated sound) to attach a record/playback device such as a cassette player, CD player, or VCR. On computers with a sound card, use the connector on the card.
4	mouse connector	Plug a standard mouse into the green mouse connector. Turn off the computer and any attached devices before you connect a mouse to the computer. If you have a USB mouse, plug it into a USB connector. If your computer is running the Microsoft® Windows® 2000 or Windows XP operating system, the necessary mouse drivers have been installed on your hard drive.
5	link integrity light	• Green — A good connection exists between a 10-Mbps network and the computer. • Orange — A good connection exists between a 100-Mbps network and the computer. • Yellow — A good connection exists between a 1-Gbps (or 1000-Mbps) connection. • Off — The computer is not detecting a physical connection to the network.
6	network connector	Attach the UTP cable to an RJ45 jack wall plate or to an RJ45 port on a UTP concentrator or hub and press the other end of the UTP cable into the network connector until the cable snaps securely into place. The use of Category 5 wiring and connectors is recommended for our customers' networks. If Category 3 wiring must be used, force the network speed to 10 Mbps to ensure reliable operation. On computers with a network connector card, use the connector on the card.
7	network activity light	Flashes a yellow light when the computer is transmitting or receiving network data. A high volume of network traffic may make this light appear to be in a steady "on" state.

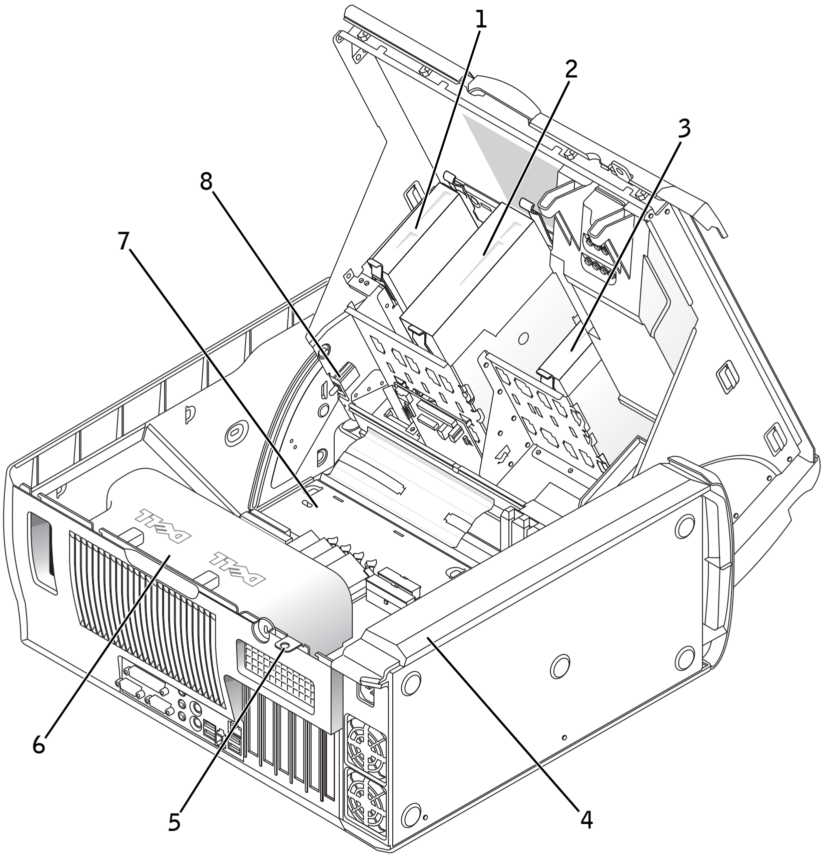
8	USB 2.0 connectors (2)	Use the back USB connectors for devices that typically remain connected, such as printers and keyboards. It is recommended that you use the front USB connectors for devices that you connect occasionally, such as joysticks or cameras.
9	IEEE 1394 connector	Attach high-speed serial multimedia devices.
10	USB 2.0 connectors (2)	Use the back USB connectors for devices that typically remain connected, such as printers and keyboards. It is recommended that you use the front USB connectors for devices that you connect occasionally, such as joysticks or cameras.
11	keyboard connector	If you have a standard keyboard, plug it into the purple keyboard connector. If you have a USB keyboard, plug it into a USB connector.
12	microphone connector	Use the pink microphone connector (available on computers with integrated sound) to attach a personal computer microphone for voice or musical input into a sound or telephony program. On computers with a sound card, use the microphone connector on the card.
13	serial connector (COM 2)	Connect a serial device, such as a handheld device, to the serial port. The default designations are COM1 for serial connector 1 and COM2 for serial connector 2. For more information, see "System Setup Options."
14	serial connector (COM 1)	Connect a serial device, such as a handheld device, to the serial port. The default designations are COM1 for serial connector 1 and COM2 for serial connector 2. For more information, see "System Setup Options."

Inside Your Computer

CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *System Information Guide*.

CAUTION: To avoid electrical shock, always unplug your computer from the electrical outlet before opening the cover.

NOTICE: Be careful when opening the computer cover to ensure that you do not accidentally disconnect cables from the system board.



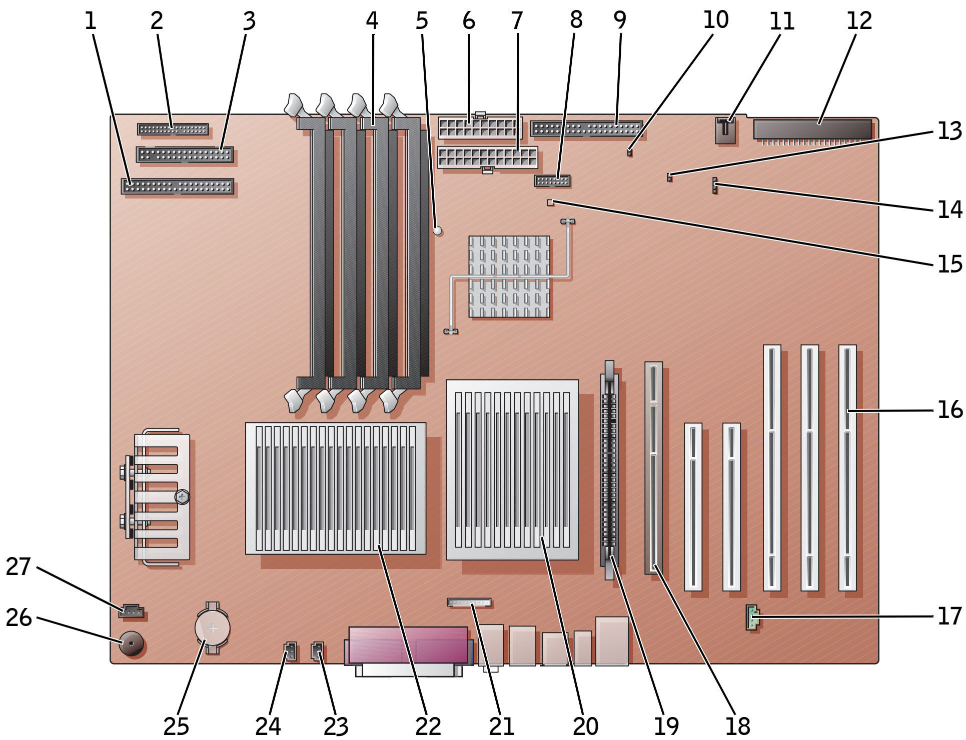
1	floppy drive	5	padlock ring
2	CD/DVD drive	6	microprocessor airflow shroud
3	hard drive	7	system board
4	power supply	8	chassis intrusion switch

Cable Colors

Device	Cable Color
Hard drive	Blue pull tab
Floppy drive	Black pull tab
CD/DVD drive	Orange pull tab

Device	Cable Color
I/O panel	Yellow pull tab

System Board Components



1	CD/DVD drive connector (IDE2)	15	standby power light (AUX_PWR_LED)
2	I/O panel connector (I/O PANEL)	16	PCI card connectors (PCI1, PCI2 [32-bit connectors], PCI3 , PCI4, and PCI5 [64-bit PCI-X connectors])
3	floppy-drive connector (DISKETTE)	17	telephony connector (MODEM)
4	memory module connectors (DIMM_1, DIMM_2, DIMM_3, DIMM_4)	18	AGP card connector (AGP)
5	suspend-to-RAM light (STR_LED)	19	VRM connector (VRM)(for a second microprocessor only)
6	power connector (POWER 2)	20	microprocessor and heat-sink connector (CPU_1)
7	power connector (POWER 1)	21	front-panel audio connector (FP2AUDIO)
8	front-panel USB/IEEE 1394 connector (USB)	22	microprocessor and heat-sink connector (CPU_0)
9	hard-drive connector (IDE1)	23	microprocessor fan connector (FAN_P1)
10	real-time clock reset jumper (RTCRST)	24	microprocessor fan connector (FAN_P0)
11	card fan connector (FAN)	25	battery socket (BATTERY)
12	SCSI drive connector (SCSI)	26	internal speaker (SPKR)
13	password jumper (PSWD)	27	CD drive audio cable connector (CD_IN)
14	auxiliary LED add-in storage adapter connector (AUX_LED)		

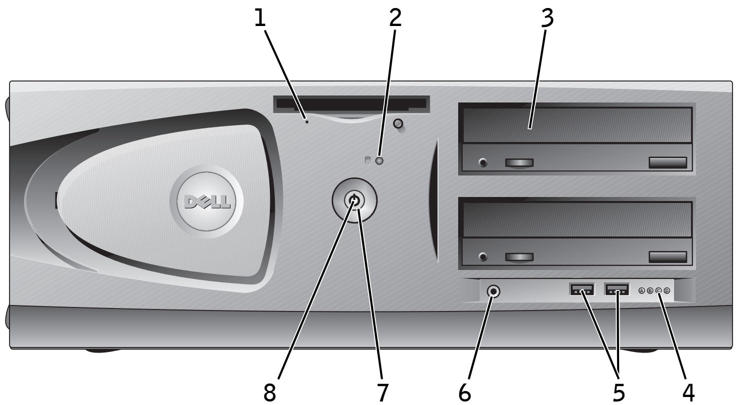
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SECTION 4

About Your Computer—Dell Precision 450

Section TOC

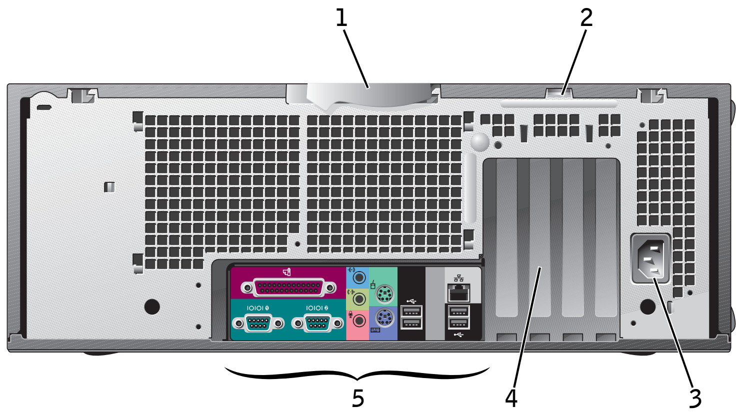
Front View



1	floppy-drive light button	The floppy-drive light is on when the computer reads data from or writes data to the floppy drive. Wait until this light turns off before you remove the floppy disk from the drive.

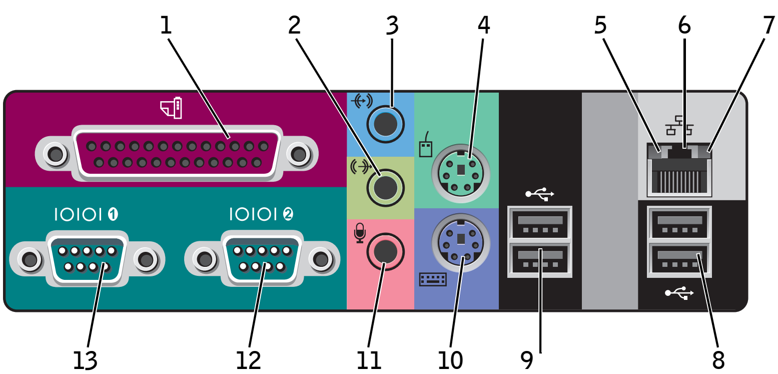
2	hard-drive light	The hard-drive light is on when the computer reads data from or writes data to the hard drive. The light might also be on when a device such as your CD player is operating.
3	CD/DVD drive	Access the CD or DVD drive.
4	diagnostic lights (4)	Use the lights to help you troubleshoot a computer problem based on the diagnostic code. For more information, see "Diagnostic Lights."
5	USB 2.0 connectors (2)	Use the front USB connectors for devices that you connect occasionally, such as joysticks or cameras. It is recommended that you use the back USB connectors for devices that typically remain connected, such as printers and keyboards.
6	headphone connector	Attach headphones.
7	power button	Press this button to turn on the computer. **NOTICE:** To avoid losing data, do not use the power button to turn off the computer. Instead, perform a Microsoft® Windows® shutdown.
8	power light	The power light illuminates and blinks or remains solid to indicate the following different states: No light — The computer is in the off state. Steady green —The computer is in a normal operating state. Blinking green —The computer is in a power-saving state. To exit from a power-saving state, press the power button or use the keyboard or the mouse if it is configured as a wake device in the Windows Device Manager. For more information about sleep states and exiting from a power-saving state, see "Power Button." See "Diagnostic Lights" for a description of light codes that can help you troubleshoot problems with your computer.

Back View



1	cover release latch	Push the latch to the left to open the computer cover.
2	padlock ring	Insert a padlock to lock the computer cover.
3	power connector	Insert the power cable.
4	card slots (4)	Access connectors for any installed PCI and AGP cards.
5	back panel connectors	Plug serial, USB, and other devices into the appropriate connector.

Back Panel Connectors



1	parallel connector	Connect a parallel device, such as a printer, to the parallel connector. If you have a USB printer, plug it into a USB connector. **NOTE:** The integrated parallel connector is automatically disabled if the computer detects an installed card containing a parallel connector configured to the same address. For more information, see "System Setup Options."
2	line-out connector	Use the green line-out connector (available on computers with integrated sound) to attach headphones and speakers. On computers with a sound card, use the connector on the card.
3	line-in connector	Use the blue line-in connector (available on computers with integrated sound) to attach a record/playback device such as a cassette player, CD player, or VCR. On computers with a sound card, use the connector on the card.
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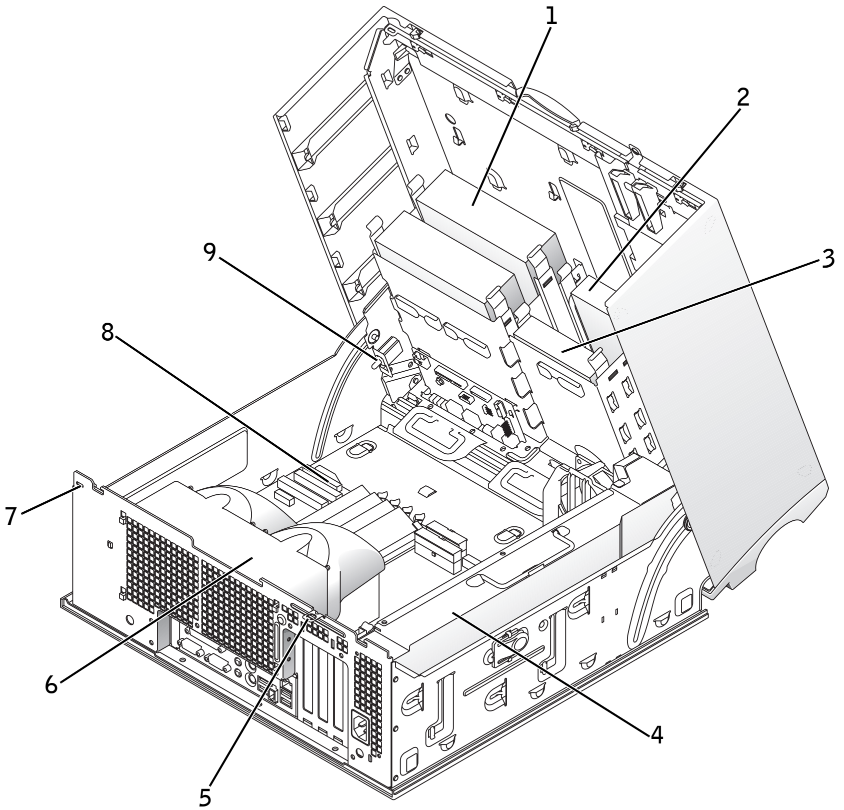
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Inside Your Computer

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CAUTION: To avoid electrical shock, always unplug your computer from the electrical outlet before opening the cover.

NOTICE: Be careful when opening the computer cover to ensure that you do not accidentally disconnect cables from the system board.



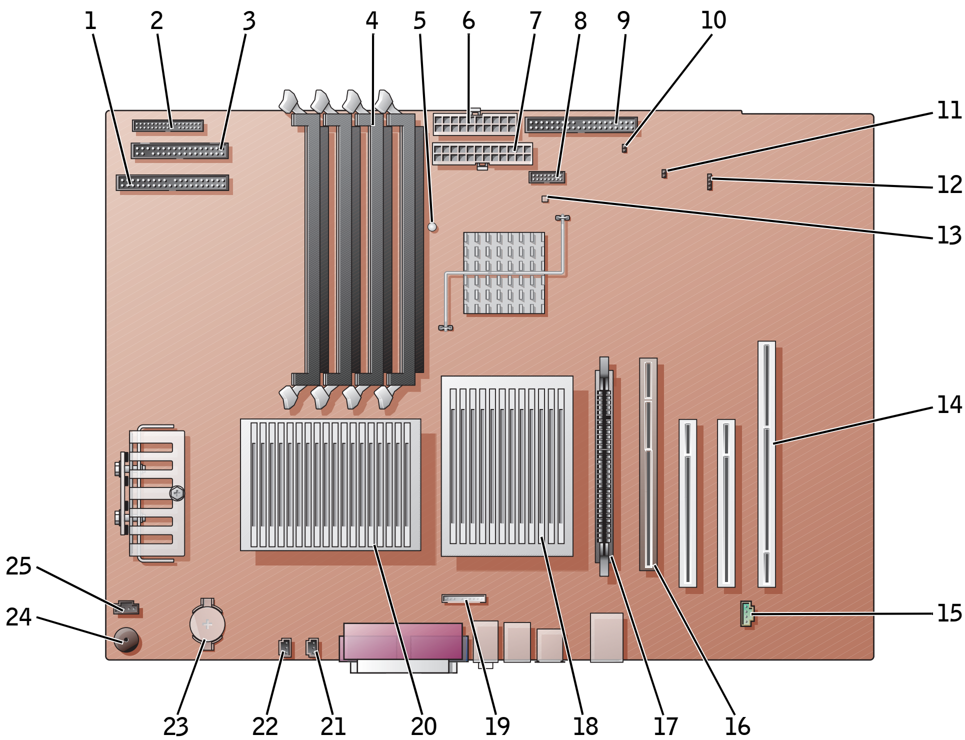
1	CD/DVD drive	6	microprocessor airflow shroud
2	floppy drive	7	security cable slot
3	hard drive	8	system board
4	power supply	9	chassis intrusion switch
5	padlock ring		

Cable Colors

Device	Cable Color
Hard drive	Blue pull tab

Device	Cable Color
Floppy drive	Black pull tab
CD/DVD drive	Orange pull tab
I/O panel	Yellow pull tab

System Board Components



1	CD/DVD drive connector (IDE2)	14	PCI card connectors (PCI1, PCI2 [32-bit connectors], and PCI3 [64-bit PCI-X connector])
2	I/O panel (I/O PANEL)	15	telephony connector (MODEM)
3	floppy drive connector (DISKETTE)	16	AGP card connector (AGP)
4	memory module connectors (DIMM_1, DIMM_2, DIMM_3, DIMM_4)	17	VRM connector (VRM) (for a second microprocessor only)
5	suspend-to-RAM light (STR_LED)	18	microprocessor and heat-sink connector (CPU_1)
6	power connector (POWER 2)	19	front-panel audio connector (FP2AUDIO)
7	power connector (POWER 1)	20	microprocessor and heat-sink connector (CPU_0)
8	USB connector (USB)	21	microprocessor fan connector (FAN_P1)
9	hard-drive connector (IDE1)	22	microprocessor fan connector (FAN_P0))
10	real-time clock reset jumper (RTCRST)	23	battery socket (BATTERY)
11	password jumper (PSWD)	24	internal speaker (SPKR)
12	auxiliary LED add-in storage adapter connector (AUX_LED)	25	CD drive audio cable connector (CD_IN)
13	standby power light (AUX_PWR_LED)		

4

SECTION 5

Advanced Features

LegacySelect Technology Control

LegacySelect technology control offers legacy-full, legacy-reduced, or legacy-free solutions based on common platforms, hard-drive images, and help desk procedures. Control is provided to the administrator through system setup, Dell OpenManage™ IT Assistant, or Dell™ custom factory integration.

LegacySelect allows administrators to electronically activate or deactivate connectors and media devices that include serial and USB connectors, a parallel connector, a floppy drive, and a PS/2 mouse. Connectors and media devices that are deactivated make resources available. You must restart the computer for the changes to take effect.

Manageability

Alert Standard Format

ASF is a DMTF management standard that specifies "pre-operating system" or "operating system-absent" alerting techniques. It is designed to generate an alert on potential security and fault conditions when the operating system is in a sleep state or the computer is powered down. ASF is designed to supersede previous operating system-absent alerting technologies.

Your computer supports the following ASF alerts and remote capabilities:

Alert	Description
`Bad CPU`	The microprocessor has been unable to execute its first instructions.
`Chassis Intrusion/Chassis Intrusion Cleared`	The computer has been opened or the chassis intrusion alert has been cleared.
`Corrupt BIOS`	The BIOS is corrupted.
`Failure to Boot to BIOS`	The BIOS did not complete loading upon initiation.

`System Password Failure`	The system password is invalid (after 3 failed attempts).
`Entity Presence`	Periodic Heartbeats have been transmitted to verify computer presence.
`Temperature - Too High (critical)`	The computer temperature is out of limits.
`Voltage - Too Low Too High (critical)`	The computer voltage is out of limits.
`Cooling Device Limits`	The computer fan speed/rpm is out of limits.
`Ethernet Connectivity Enabled/Ethernet Connectivity Disabled`	The Ethernet connectivity is enabled or Ethernet connectivity is disabled.
`Power Supply`	A fan or voltage failure exists inside the power supply.

For more information about Dell's ASF implementation, see the *ASF User's Guide* and the *ASF Administrator's Guide*, available on the Dell Support website at **support.dell.com**.

Dell OpenManage IT Assistant

IT Assistant configures, manages, and monitors computers and other devices on a corporate network. IT Assistant manages assets, configurations, events (alerts), and security for computers equipped with industry-standard management software. It supports instrumentation that conforms to SNMP, DMI, and CIM industry standards.

Dell OpenManage Client instrumentation, which is based on DMI and CIM, is available for your computer. For information on IT Assistant, see the *Dell OpenManage IT Assistant User's Guide* available on the Dell Support website at **support.dell.com**.

Dell OpenManage Client Instrumentation

Dell OpenManage Client Instrumentation is software that enables remote management programs such as IT Assistant to do the following:

- Access information about your computer, such as how many processors it has and what operating system it is running
- Monitor the status of your computer, such as listening for thermal alerts from temperature probes or hard-drive failure alerts from storage devices
- Change the state of your computer, such as updating its BIOS or shutting it down remotely

A managed system is one that has Dell OpenManage Client Instrumentation set up on a network that uses IT Assistant. For information about Dell OpenManage Client Instrumentation, see the *Dell OpenManage Client Instrumentation User's Guide* available on the Dell Support website at **support.dell.com**.

Security

Chassis Intrusion Detection

NOTE: When the setup password is enabled, you must know the setup password before you can reset the **Chassis Intrusion** setting.

This feature detects that the chassis was opened and alerts the user. To change the **Chassis Intrusion** setting:

1. Enter system setup.
2. Press the down-arrow keys to move to the **System Security** option.
3. Press <Enter> to access the **System Security** option's pop-up menu.
4. Press the down-arrow key to move to the **Chassis Intrusion** setting.
5. Press the spacebar to select an option setting.
6. Exit system setup.

Option Settings

- **Enabled** — If the computer cover is opened, the setting changes to **Detected**, and the following alert message displays during the boot routine at the next computer start-up:

  `Alert! Cover was previously removed.`

  To reset the **Detected** setting, enter system setup. In the **Chassis Intrusion** option, press the left- or right-arrow key to select **Reset**, and then choose **Enabled**, **Enabled-Silent**, or **Disabled**.
- **Enabled-Silent** (default) — If the computer cover is opened, the setting changes to **Detected**. No alert message appears during the boot sequence at the next computer start-up.
- **Disabled** — No intrusion monitoring occurs and no messages appear.

Padlock Ring and Security Cable Slot

Use one of the following methods to secure your computer:

- Use a padlock alone or a padlock and looped security cable with the padlock ring.

  A padlock alone prevents the computer from being opened.

  A security cable looped around a stationary object is used in conjunction with a padlock to prevent unauthorized movement of the computer.

- Attach a commercially available antitheft device to the security cable slot on the back of the computer.

NOTE: Before you purchase an antitheft device, ensure that it works with the security cable slot on your computer.

Antitheft devices usually include a segment of metal-stranded cable with an attached locking device and key. A Kensington lock is recommended. The documentation that comes with the locking device contains instructions for installing it.

Password Protection

NOTICE: Although passwords provide security for the data on your computer, they are not foolproof. If your data requires more security, it is your responsibility to obtain and use additional forms of protection, such as data encryption programs.

System Password

NOTICE: If you leave your computer running and unattended without having a system password assigned, or if you leave your computer unlocked so that someone can disable the password by changing a jumper setting, anyone can access the data stored on your hard drive.

Option Settings

You cannot change or enter a new system password if either of the following two options is displayed:

- **Enabled** — A system password is assigned.
- **Disabled —** The system password is disabled by a jumper setting on the system board.

You can only assign a system password when the following option is displayed:

- **Not Enabled** — A system password has not been assigned and the password jumper on the system board is in the enabled position (the default).

Assigning a System Password

To escape from the field without assigning a system password, press <Tab> or the <Shift><Tab> key combination to move to another field, or press <Esc> at any time before you complete step 5.

1. Enter system setup and verify that **Password Status** is set to **Unlocked**.
2. Highlight **System Password** and then press the left- or right-arrow key.

   The option heading changes to **Enter Password**, followed by an empty 32-character field in square brackets.
3. Type your new system password.

   You can use up to 32 characters. To erase a character when entering your password, press <Backspace> or the left-arrow key. The password is not case sensitive.

   Certain key combinations are not valid. If you enter one of these combinations, the speaker emits a beep.

   As you press each character key (or the spacebar for a blank space), a placeholder appears in the field.
4. Press <Enter>.

   If the new system password is less than 32 characters, the whole field fills with placeholders. Then the option heading changes to **Verify Password**, followed by another empty 32-character field in square brackets.
5. To confirm your password, type it a second time and press <Enter>.

   The password setting changes to **Enabled**.
6. Exit system setup.

   Password protection takes effect when you restart the computer.

Typing Your System Password

When you start or restart your computer, one of the following prompts appears on the screen.

If **Password Status** is set to **Unlocked**:

```
Type in the password and
- press <ENTER> to leave password security enabled.
- press <CTRL><ENTER> to disable password security.
Enter password:
```

If **Password Status** is set to **Locked**:

```
Type the password and press <Enter>.
```

If you have assigned a setup password, the computer accepts your setup password as an alternate system password.

If you type a wrong or incomplete system password, the following message appears on the screen:

```
** Incorrect password. **
```

If you again type an incorrect or incomplete system password, the same message appears on the screen. The third and subsequent times you type an incorrect or incomplete system password, the computer displays the following message:

```
** Incorrect password. **
Number of unsuccessful password attempts: 3
System halted! Must power down.
```

Even after your computer is turned off and on, the previous message is displayed each time you type an incorrect or incomplete system password.

NOTE: You can use Password Status in conjunction with System Password and Setup Password to further protect your computer from unauthorized changes.

Deleting or Changing an Existing System Password

1. Enter system setup and verify that **Password Status** is set to **Unlocked**.
2. Restart your computer.
3. When prompted, type the system password.
4. Press <Ctrl><Enter> to disable the existing system password.
5. Confirm that **Not Enabled** is displayed for the **System Password** option.

   If **Not Enabled** is displayed, the system password is deleted. If **Not Enabled** is not displayed, press <Alt><b> to restart the computer, and then repeat step 3 through step 5.

   To assign a new password, follow the procedure in "Assigning a System Password."
6. Exit system setup.

Setup Password

Option Settings

- **Enabled** — Does not allow assignment of setup passwords; you must enter a setup password to make changes to system setup.
- **Not Enabled** — Allows assignment of setup passwords; password feature is enabled but no password is assigned.

Assigning a Setup Password

The setup password can be the same as the system password.

NOTE: If the two passwords are different, the setup password can be used as an alternate system password. However, the system password cannot be used in place of the setup password.

1 Enter system setup and verify that **Setup Password** is set to **Not Enabled.**

2 Highlight **Setup Password** and press the left- or right-arrow key.

   The computer prompts you to type and verify the password. If a character is not permitted, the computer emits a beep.

3 Type and then verify the password.

   After you verify the password, the **Setup Password** setting changes to **Enabled**. The next time you enter system setup, the computer prompts you for the setup password.

4 Exit system setup.

   A change to **Setup Password** becomes effective immediately (no need to restart the computer).

Operating Your Computer With a Setup Password Enabled

When you enter system setup, the **Setup Password** option is highlighted, prompting you to type the password.

If you do not type the correct password, the computer lets you view, but not modify, system setup options.

NOTE: You can use password status in conjunction with setup password to protect the system password from unauthorized changes.

Deleting or Changing an Existing Setup Password

To change an existing setup password, you must know the setup password.

1 Enter system setup.

2 Type the setup password at the prompt.

3 Highlight **Setup Password** and press the left- or right-arrow key to delete the existing setup password.

The setting changes to **Not Enabled**.

To assign a new setup password, perform the steps in "Assigning a System Password."

4 Exit system setup.

Disabling a Forgotten Password and Setting a New Password

NOTICE: This process erases both the system and setup passwords.

CAUTION: Before you open the computer cover, see the safety instructions in the *System Information Guide*.

1 Open the computer cover.

2 Remove the jumper plug labeled "PSWD" from the jumper.

See "Jumper Settings" to locate the password jumper.

3 Close the computer cover.

4 Reconnect your computer and devices to electrical outlets and turn them on.

This disables the existing password(s).

5 Enter system setup and verify that **Setup Password** is set to **Disabled**.

6 Exit system setup.

CAUTION: Before you open the computer cover, see the safety instructions in the *System Information Guide*.

7 Open the computer cover.

8 Replace the PSWD jumper plug.

9 Close the computer cover and reconnect the computer and devices to electrical outlets and turn them on.

This reenables the password feature. When you enter system setup, both password options appear as **Not Enabled**—the password feature is enabled but no password is assigned.

10 Assign a new system and/or setup password.

System Setup

Use system setup settings as follows:

- To set user-selectable options such as date and time or system password
- To read the current amount of memory or set the type of hard drive installed

It is recommended that you print the system setup screens (by pressing <Print Screen>) or record the information for future reference.

Before you use system setup, you must know the kind of floppy drive(s) and hard drive(s) installed in your computer. To confirm this information, see the Manufacturing Test Report that came with your computer, or find this information in the online **Dell Accessories** folder.

Entering System Setup

1. Turn on or restart your computer.
2. When `Press <F2> to Enter Setup` appears in the upper-right corner of the screen, press <F2> immediately.

   If you wait too long and the Microsoft® Windows® logo appears, continue to wait until you see the Windows desktop. Then shut down your computer and try again.

NOTE: To ensure an orderly computer shutdown, consult the documentation that came with your operating system.

System Setup Screens

System setup screens display current configuration information for your computer. Information on the screen is organized into four areas:

- Title — The box at the top of all screens that lists the computer name
- Computer data — Two boxes below the title box that display your computer processor, L2 cache, service tag, and the version number of the BIOS
- Options — A scrollable box listing options that define the configuration of your computer, including installed hardware, power conservation, and security features

  Fields to the right of the option titles contain settings or values. The fields that you can change appear bright on the screen. The fields that you cannot change (because they are set by the computer) appear less bright. When <Enter> appears to the right of an option title, press <Enter> to access a popup menu of additional options.

- Key functions — A line of boxes across the bottom of all screens that lists keys and their functions within system setup
  - <F1> — Access the System Setup Help
  - <ESC> — Exit System Setup

System Setup Navigation Keys

Keys	Action
Tab or ↓	Moves to the next field.
Shift Tab or ↑	Moves to the previous field.
← or →	Cycles through the options in a field. In many fields, you can also type the appropriate value.
Page Down or Page Up	Scrolls through help information.
Enter	Enters the selected field's pop-up options menu.
spacebar or + = or –	In the selected field's pop-up options menu, cycles through the options in a field.
Alt X	Exits system setup without restarting the computer and returns the computer to the boot routine.
Alt B	Exits system setup and restarts the computer, implementing any changes you have made.
Alt D	Resets the selected option to the default.

Boot Sequence

This feature allows users to change the sequence of devices from which the computer boots.

Option Settings

- **Normal —** (Available only for the current boot process.) The computer attempts to boot from the sequence of devices specified in system setup.
- **Diskette Drive —** The computer attempts to boot from the floppy drive. If the floppy disk in the drive is not bootable, or if no floppy disk is in the drive, the computer generates an error message.
- **Hard Disk Drive C:** — The computer attempts to boot from the primary hard drive. If no operating system is on the drive, the computer generates an error message.
- **CD Drive** — The computer attempts to boot from the CD drive. If no CD is in the drive, or if the CD has no operating system, the computer generates an error message.
- **Integrated NIC —** As the computer boots, it prompts you to press <Ctrl><Alt><b>. Pressing this key combination causes a menu to display that allows you to select a method for booting from a network server. If a boot routine is not available from the network server, the computer attempts to boot from the next device in the boot sequence list.
- **USB Flash Device** — Insert the key into a USB port and restart the computer. When `F12 = Boot Menu` appears in the upper-right corner of the screen, press <F12>. The BIOS detects the key and adds the USB key option to the boot menu.

Changing the Computer Boot Sequence for the Current Boot

You can use this feature, for example, to tell the computer to boot from the CD drive so you can run the Dell Diagnostics, and specify that the computer boots from the hard drive when the diagnostic tests are complete.

1 Turn on or restart your computer.

2 When `F2 = Setup` appears in the upper-right corner of the screen, press <F12>.

   If you wait too long and the Microsoft Windows logo appears, continue to wait until you see the Windows desktop. Then shut down your computer and try again.

NOTE: To ensure an orderly computer shutdown, consult the documentation that came with your operating system.

   The **Boot Device Menu** appears, listing all available boot devices. Each device has a number next to it. At the bottom of the menu, enter the number of the device that is to be used for the current boot only.

Changing Boot Sequence for Future Boots

1 Enter system setup.

2 Use the arrow keys to highlight the **Boot Sequence** menu option and press <Enter> to access the pop-up menu.

NOTE: Write down your current boot sequence in case you want to restore it.

3 Press the up- and down-arrow keys to move through the list of devices.

4 Press the spacebar to enable or disable a device (enabled devices have a checkmark).

5 Press plus (+) or minus (–) to move a selected device up or down the list.

System Setup Options

Asset Tag — Displays the customer-programmable asset tag number for the computer if an asset tag number is assigned.
Auto Power On — Sets time and days of week to turn on the computer automatically. Choices are every day or every Monday through Friday. Time is kept in a 24-hour format (*hours:minutes*). Change the start-up time by pressing the right- or left-arrow keys to increase or decrease the numbers or to type numbers in both the date and time fields. **Disabled** is the default. This feature does not work if you turn off your computer using a power strip or surge protector.
CPU Information • **CPU Speed** — Processor speed at which the computer boots Press the left- or right-arrow key to toggle the **CPU Speed** option between the resident microprocessor's rated speed (the default) and a lower compatibility speed. To toggle between the rated processor speed and the compatibility speed while the computer is running in real mode, press <Ctrl><Alt><\>. (For keyboards that do not use American English, press <Ctrl><Alt><#>.) • **Bus Speed —** Speed of the microprocessor's system bus • **Processor ID —** Manufacturer's identification code(s) for the installed microprocessor • **Clock Speed** — Core speed at which the microprocessor(s) operates • **Cache Size** — Size of the microprocessor's L2 cache • **Hyper-Threading** — Enables or disables Hyper-Threading technology for operating systems that support this feature. The default setting is **Disabled**.

Diskette Drive A — Type of floppy drive(s) installed in the computer. With the standard cabling configuration, **Diskette Drive A** (the boot floppy drive) is the 3.5-inch floppy drive installed in the top externally accessible drive bay. The two options are **3.5 Inch, 1.44 MB, and Not Installed.**

Tape drives are not reflected in the **Diskette Drive A** option. For example, if a single floppy drive and a tape drive are attached to the floppy drive interface cable, set **Diskette Drive A** to **3.5 Inch, 1.44 MB**.

HARD-DISK DRIVE SEQUENCE — Allows the selection specific drive devices for priority in boot. When this field is highlighted, press <Enter>.

A second dialog box appears with the list of devices that can be selected. Use the +/- keys to move the device highlighted up or down in the priority list.

Fastboot

- **On** (default) — Your computer boots faster by skipping certain configurations and tests.
- **Off —** Your computer does not skip certain configurations and tests during the boot process.

Integrated Devices — Configures the following devices integrated with the system board:

- **Sound —** Settings are **On** (default) or **Off.**
- **USB Controller —** Settings are **On** or **Off**.
- **Network Interface Controller** — Settings are **On** (default), **Off,** or **On w/ PXE**.
- **Mouse Port —** Settings are **On** or **Off**.
- **Serial Port 1 and Serial Port 2 —** Settings are **Off** and **Auto** (default).

  Auto automatically configures a connector to a particular designation (**COM1** or **COM3** for **Serial Port 1**; **COM2** or **COM4** for **Serial Port 2**).

  If you set a serial connector to **Auto** and add a card containing a connector configured to the same designation, the computer automatically remaps the integrated port to the next available connector designation that shares the same IRQ setting as follows:

  – **COM1** (I/O address 3F8h), which shares IRQ4 with **COM3**, is remapped to **COM3** (I/O address 3E8h).

  – **COM2** (I/O address 2F8h), which shares IRQ3 with **COM4**, is remapped to **COM4** (I/O address 2E8h).

NOTE: When two COM connectors share an IRQ setting, you can use either connector as necessary, but you may not be able to use them both at the same time. If you are running the Microsoft Windows 95 or IBM® OS/2® operating system, you cannot use both serial connectors at the same time. If the second connector (COM3 or COM4) is also in use, the integrated connector is turned off.

- **Parallel Port —** The settings are **Mode**, **I/O Address**, and **DMA Channel**.

  Mode settings are **PS/2**, **EPP**, **ECP**, **AT**, or **Off**. Set the **Mode** option according to the type of device connected to the parallel connector. To determine the correct mode to use, see the documentation that came with the device.

  I/O Address settings are **378h** (default), **278h**, or **3BCh.** The settings are not available when **Mode** is set to **Off**.

NOTE: You cannot set the parallel connector to 3BCh if Mode is set to EPP.

  DMA Channel appears only when **Mode** is set to **ECP**. Settings are **DMA 1**, **DMA 3**, or **Off**.

- **IDE Drive Interface —** The settings are **Off** and **Auto** (default).

  Auto turns off the IDE interface when necessary to accommodate a controller card installed in an expansion slot.

- **Diskette Interface** — The settings are **Auto** (default), **Read Only**, and **Off**.

  Auto turns off the integrated floppy drive controller when necessary to accommodate a controller card installed in an expansion slot.

  Read Only prevents the computer's integrated floppy drive controller from writing to floppy drives and activates **Auto**.
- **USB Emulation —** The settings are **On** and **Off**.
- **Primary Video Controller** — The settings are **Auto** and **AGP** (default).

  Auto — If only an AGP card is installed, the computer uses the AGP card; if only a PCI card is installed, the computer uses the PCI card; if *both* AGP and PCI cards are installed, the computer uses the PCI card to boot.

  AGP (default) — The computer uses the AGP card.
- **Video DAC Snoop** — The settings are **Off** (default) and **On**.

  On corrects video problems such as incorrect colors or blank windows that may occur when you use certain video cards.

For the Dell Precision™ Workstation 650 only:

- **1394 Controller — Enabled** is the default.
- **SCSI Controller** — **Disabled** is the default.

KEYBOARD NUMLOCK — The settings are **On** and **Off** (does not apply to 84-key keyboards).

On — Activates the rightmost bank of keys so they provide the mathematical and numeric functions shown at the top of each key.

Off — Activates the rightmost bank of keys so they provide cursor-control functions shown by the label on the bottom of each key.

MEMORY INFORMATION — Indicates amount of installed memory, computer memory speed, and AGP Aperture size

PCI IRQ ASSIGNMENT — Specifies which IRQ lines are assigned to the PCI devices installed in the computer

Press <Enter> and then select the device whose IRQ line you want to change, and press the plus (+) or minus (–) key to scroll through the available IRQ lines.

POWER MANAGEMENT —

- **Suspend Mode** — Selects S1 or S3 (default) power management suspend mode
- **AC Power Recovery —** Determines what happens when AC power is restored to the computer
  - **Off** — The computer remains off when AC power is restored.
  - **On** — The computer starts when AC power is restored.
  - **Last** — The computer returns to the AC power state existing at the time that AC power was lost.
- **Low Power Mode** — Selects the amount of power used when the computer is in hibernate mode or off. **Disabled** is the default. When **Enabled**, Remote Wake-Up events no longer start the computer from hibernate mode or off.

Primary Drive *n* and Secondary Drive *n* — The settings are **Auto** (use this setting for all IDE devices from Dell) and **Off**.

Primary Drive *n* — Identifies drives attached to the primary IDE interface connector (labeled "IDE1") on the system board.

Secondary Drive *n* — Identifies drives connected to the secondary IDE interface connector (labeled "IDE2").

NOTE: You must have an IDE device connected to the primary IDE interface if you have an IDE device connected to the secondary IDE interface.

If You Have a Problem

If the computer generates a drive error message the first time you boot your computer after you install an IDE drive, your drive may not work with the automatic drive-type detect feature. Press <Alt><d> in any hard drive field to set the hard drive autoconfiguration feature.

During POST the computer scans the IDE channels for supported devices and generates a summary message. For example, if the computer detects that a hard drive is connected to the Primary channel and that a CD drive is connected to the Secondary channel, the computer generates the following message:

```
Performing automatic IDE configuration...
Primary Master: IDE Disk Drive
Secondary Master: CD-ROM Reader
```

If the computer detects a device during the scan, it sets the device to **Auto** in system setup. If no device is listed, it sets the device setting to **Off** in system setup.

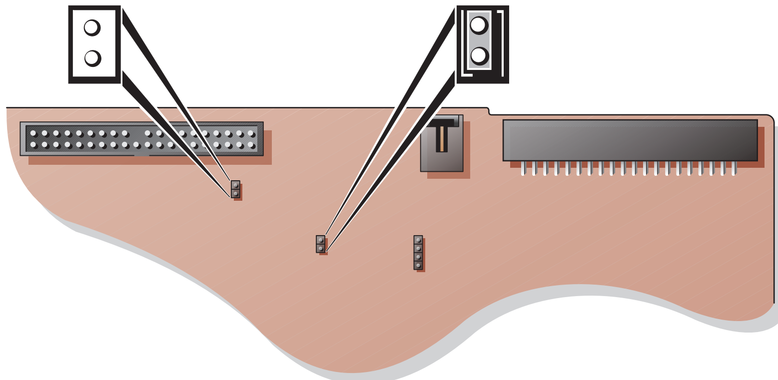
If your computer does not reset after you perform these steps, enter system setup and reset the computer to its original factory settings:

1. Restart your computer.
2. As the computer restarts, press <F2> to enter system setup.
3. When the system setup screen appears, press <Alt><F> to load the default settings.

   The computer beeps when the settings are restored.
4. Verify that the time, date, and year are correct and that the **Secondary Drive 0** option is set to **Auto**.
5. Press <Esc> and then press <Enter> to save your changes and exit.

   The computer restarts.

Jumper Settings



NOTICE: Ensure that your computer is turned off and unplugged before you change the jumper settings. Otherwise, damage to your computer or unpredictable results can occur.

To change a jumper setting, pull the plug off its pin(s) and carefully fit it down onto the pin(s) indicated.

Jumper	Setting	Description
PSWD	 (default)	Password features are enabled.
		Password features are disabled.
RTCRST		Real-time clock reset

 *jumpered*  *unjumpered*

Power Button

NOTICE: To turn off your computer, perform an orderly computer shutdown when possible.

You can use the ACPI feature to configure the function of the Microsoft Windows 2000 and Windows XP operating systems.

Power Button Functions for Operating Systems With ACPI Enabled

Action	Computer Turned On and ACPI Enabled	Computer in Standby Mode	Computer Turned Off
Press power button	Computer goes into standby mode or turns off (depending on the operating system setup)	Computer turns on	Boots and computer turns on
Hold power button for 6 seconds	Computer turns off	Computer turns off	Boots and computer turns on
NOTE: Pressing or holding the power button to shut down the computer may result in data loss. Use the power button to shut down the computer only if the operating system is not responding.			

TAPI

NOTE: See the documentation that came with the TAPI-compliant card for more information on using TAPI devices and to verify that the card works with your computer.

Your computer supports TAPI-compliant modem cards using the standard TAPI connector (the green connector labeled MODEM or TELEPHONY). If your modem supports voice features, you can connect your modem to the TAPI connector and then use your audio speakers and microphone as an answering machine or speakerphone. The microphone carries your voice into the computer and then through the TAPI system board connector to your modem card. The caller's voice enters through the modem card to the TAPI system board connector and then out to the speakers. You can also use this configuration to record and play audio files over the telephone by using third-party software.

CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *System Information Guide*.

CAUTION: To guard against electrical shock, always unplug your computer from the electrical outlet before opening the cover.

Installing a TAPI-Compliant Modem Card

1 Shut down the computer through the **Start** menu.

2 Ensure that your computer and attached devices are turned off. If your computer and attached devices did not automatically turn off when you shut down your computer, turn them off now.

NOTICE: To disconnect a network cable, first unplug the cable from your computer and then unplug it from the network wall jack.

3 Disconnect any telephone or telecommunication lines from the computer.

4 Disconnect your computer and all attached devices from electrical outlets, and then press the power button to ground the system board.

5 If you have installed a padlock through the padlock ring on the back panel, remove the padlock.

CAUTION: To guard against electrical shock, always unplug your computer from the electrical outlet before opening the cover.

NOTICE: Before touching anything inside your computer, ground yourself by touching an unpainted metal surface, such as the metal at the back of the computer. While you work, periodically touch an unpainted metal surface to dissipate any static electricity that could harm internal components.

6 Open the computer cover.

7 Install the TAPI-compliant modem card:

a Connect the 4-pin TAPI cable to the TAPI system board connector.

To locate the TAPI connector on the system board, see the system board components illustration for your computer (for the Dell Precision 450 computer, see "System Board Components" or for the Dell Precision 650 computer, see "System Board Components").

b Connect the other end of the cable to the TAPI connector on the modem card.

To locate the TAPI connector on the card, see the documentation for the card.

8 Close the computer cover.

9 Reconnect the computer and devices to electrical outlets, and turn them on.

10 Install the appropriate modem driver and voice program.

For more information, see the manufacturer's documentation and your Microsoft® Windows® documentation.

Installing a TAPI Sound Card

You can connect your modem to a TAPI-compliant sound card connector (typically labeled TAD) and then use the audio capabilities as a speakerphone.

1 Shut down the computer through the **Start** menu.

2 Ensure that your computer and attached devices are turned off. If your computer and attached devices did not automatically turn off when you shut down your computer, turn them off now.

NOTICE: To disconnect a network cable, first unplug the cable from your computer and then unplug it from the network wall jack.

3 Disconnect any telephone or telecommunication lines from the computer.

4 Disconnect your computer and all attached devices from electrical outlets, and then press the power button to ground the system board.

5 If you have installed a padlock through the padlock ring on the back panel, remove the padlock.

CAUTION: To guard against electrical shock, always unplug your computer from the electrical outlet before opening the cover.

NOTICE: Before touching anything inside your computer, ground yourself by touching an unpainted metal surface, such as the metal at the back of the computer. While you work, periodically touch an unpainted metal surface to dissipate any static electricity that could harm internal components.

6 Open the computer cover.

7 Install the TAPI-compliant sound card.

8 Connect external audio devices to the sound card's connectors. Do not connect external audio devices to the microphone, speaker/headphone, or line-in connectors on the front or back panel of your computer.

9 Connect the 4-pin TAPI cable to the TAPI sound card connector.

To locate the TAPI connector on the sound card, see the documentation for the card.

10 Connect the other end of the cable to the TAPI connector on the modem card.

To locate the TAPI connector on the card, see the documentation for the card.

11 Close the computer cover.

12 Reconnect the computer and devices to electrical outlets, and turn them on.

13 Enter system setup, go to **Integrated Devices**, and change the setting for **Sound** to **Off**.

14 Install the appropriate drivers for the new devices.

For more information, see the manufacturer's documentation and your Windows documentation.

Hyper-Threading

Hyper-Threading is an Intel® technology that can enhance overall performance by allowing one physical microprocessor to function as two logical microprocessors, capable of performing certain tasks simultaneously. It is recommended that you use the Windows XP operating system because Windows XP is optimized to take advantage of Hyper-Threading technology. While many programs can benefit from Hyper-Threading technology, some programs have not been optimized for Hyper-Threading and may require an update from the software manufacturer. Contact the software manufacturer for updates and information on using your software with Hyper-Threading.

To determine if your computer is using Hyper-Threading technology:

1. Click the **Start** button, right-click **My Computer**, and then click **Properties**.
2. Click **Hardware** and click **Device Manager**.
3. In the **Device Manager** window, click the plus (+) sign next to the processor type. If Hyper-Threading is enabled, the processor is listed twice.

You can enable or disable Hyper-Threading through system setup. For more information on Hyper-Threading, search the Knowledge Base on the Dell Support website at **support.dell.com**.

IEEE 1394

IEEE 1394 is a digital interface that can move large amounts of data between computers and peripheral devices. IEEE 1394 is ideal for use with multimedia devices because it speeds the transfer of data and large files, which enables a computer to connect directly to devices such as digital video cameras.

The Dell Precision 650 computer provides a standard IEEE 1394 connector on both the front and back panels (see "About Your Computer—Dell Precision 650").

U320 SCSI Controller

The U320 SCSI controller is PCI-X based and operates in a low voltage differential (LVD) mode while running at U320 (320 MBps) speeds. The bus is backward compatible and can run at U160 (160 MBps), Ultra2 (80 MBps), Ultra (40 MBps) speeds.

If single-ended (SE)devices are connected to the same bus as the LVD devices (such as U320, U160, or Ultra2), the SCSI bus operates in SE mode and runs at maximum of Ultra (40 MBps) speed.

For more information installing a SCSI device and SCSI ID settings for the Dell Precision 650, see "SCSI Device Installation Guidelines."

Integrated Striping

Your Dell Precision 650 computer supports integrated striping for a minimum of two hard drives to a maximum of four hard drives on the Integrated Ultra320 SCSI channel. Integrated striping writes data across multiple hard drives rather than writing to one hard drive by partitioning each hard drive's storage space into stripes. The stripe volume can be created and deleted through a SCSI BIOS configuration utility.

Creating a Stripe Volume

NOTICE: Creating a stripe volume deletes all information that is currently on your hard drives. Save all data before you begin this procedure.

1 Press <Ctrl><a> during system start-up when the following message appears: `Press Cntl-A to start LSI Logic Configuration Utility`.

NOTE: Key combinations for the utility are listed at the bottom of the configuration screen.

2 Select the drive controller and press <Enter>.

3 Use the arrow keys to select **Add RAID Array** and press <Enter>.

4 Use the <+> key to select **YES** for each drive that you want to be part of a stripe volume. Use the <-> key to select **NO** for each drive that you do not want to be part of a stripe volume.

NOTE: Multiple warning screens may appear if you have a valid partition on the drives selected or if the drives selected to be part of the stripe are different sizes.

5 Press <F3> to save the changes.

6 Press any key to continue.

7 If you do not want to create the stripe volume, select **Discard Changes Then Exit this Menu**.

If you are ready to create the stripe volume, Select **Save Changes Then Exit This Menu** and press <Enter>.

While the configuration utility establishes the stripe volume, the following message appears: `Processing...takes upto one minute.` The main menu appears once the stripe volume is created.

8 Press <Esc>, exit the configuration utility, and then press <Enter>.

The stripe volume can be used as a boot volume or as a data volume. For more information, see your operating system documentation.

NOTE: If you choose unequal drive sizes to be part of the stripe volume, the available size of the stripe volume is equal to the number of drives in the volume multiplied by the smallest drive size in the volume. The unused space in the larger drive is unusable.

Deleting a Stripe Volume

NOTICE: Deleting stripe volume deletes all information that is currently on your stripe volume. Save all data before you begin this procedure.

1 Press <Ctrl><a> during system start-up when the following message appears: `Press Cntl-A to start LSI Logic Configuration Utility`.

NOTE: Key combinations for the utility are listed at the bottom of the configuration screen.

2 Select the drive controller and press <Enter>.

3 Using the arrow keys, select **Activate/Delete RAID Array** and press <Enter>.

If more than one stripe volume is present on the controller, press any key to continue and press <F2> to return to the top menu.

4 Select **Delete Array** and press <Enter>.

5 Press <F3> to delete the stripe volume.

While the configuration utility deletes the stripe volume, the following message appears: `Processing...takes upto one minute`. The main menu appears once the stripe volume is deleted.

Activating a Stripe Volume

NOTE: A controller supports only one stripe volume. If more than one stripe volume is connected to a controller, you can activate the stripe volume you want to use through the configuration utility.

1 Press <Ctrl><a> during system start-up when the following message appears: `Press Cntl-A to start LSI Logic Configuration Utility`.

NOTE: Key combinations for the utility are listed at the bottom of the configuration screen.

2 Select the drive controller and press <Enter>.

3 Using the arrow keys, select **Activate/Delete RAID Array** and press <Enter>.

4 Press any key to continue.

5 Use the <Page Up> or the <Page Down> keys to select the volume to be activated.

6 Press <F2> to return to the top menu.

7 Select **Activate Array** and press <Enter>.

8 Press any key to continue.

   While the configuration utility activates the stripe volume and deactivates the other stripe volumes, the following message appears: `Processing...takes upto one minute`. The main menu appears once the stripe volume is activated.

NOTE: If a partial stripe volume is present and no longer part of a good array, the partial stripe volume can be deleted, see "Deleting a Stripe Volume."

Troubleshooting the Stripe Volume

DURING INSTALLATION, NO SCSI DRIVES ARE FOUND —

- Ensure that all devices are connected.
- Ensure that each device has a unique SCSI ID, including the SCSI controller.
- Ensure that the SCSI controller is enabled in the system BIOS.
- Ensure that all devices can be seen in the Fusion-MPT SCSI BIOS display banner when the computer starts up.
- Reset the Fusion-MPT SCSI BIOS setting to default.

DURING INSTALLATION BLUE SCREENS OCCUR AND THE MESSAGE `"inaccessible boot device"` **APPEARS —**

This error may be caused by:

- Not pressing <F6> at the correct time during the operating system installation

  Restart the computer and operating system installation. Press <F6> when prompted during the Microsoft Windows operating system installation to load the drivers using the driver diskette for the SCSI controller.

NOTE: To create the driver diskette, use your *Drivers and Utilities* CD.

- IRQ or I/O address conflict

  Remove any third party components that were added.

- Boot order configuration

  Ensure that the SCSI is part of the boot order configuration in system setup.

- Master Boot Record Infection

  Use a virus scanning program to determine if a virus has infected the master boot record of the boot device. For help resolving virus issues, see the Knowledge Base at **support.dell.com**.

A HARD DRIVE IS RECOGNIZED AS SEVEN DIFFERENT DEVICES WHEN ONLY ONE IS PHYSICALLY CONNECTED TO THE SCSI BUS —

An older SCSI device may incorrectly indicate to the operating system that it supports multiple LUNs. Contact the device manufacturer for a firmware upgrade.

PROBLEMS WITH CERTAIN SCSI DEVICES WHEN USING AN ULTRA320 SCSI ADAPTER —

Some SCSI devices do not operate properly when the controller attempts to negotiate Ultra320 SCSI transfer rates. Lower the transfer speed setting with the Fusion-MPT SCSI BIOS Configuration Utility. Press <Ctrl><a> during system start-up when the following message appears: `Press Cntl-A to start LSI Logic Configuration Utility`.

THE COMPUTER HANGS AT BOOT, HAS A LONG BOOT TIME, OR A SCSI DEVICE IS NOT AVAILABLE —

Some older SCSI devices do not support Domain Validation operations, which is a feature of Ultra320 SCSI. When the computer boots, it performs Domain Validation to test the data integrity of the SCSI bus between the host adapter and each SCSI device. With some older SCSI devices, the Domain Validation operations can cause the device to stop responding to SCSI commands.

Check all internal and external SCSI bus cable connections. If the problem continues, disable Domain Validation for a specific SCSI device. To disable Domain Validation for a specific SCSI device, use the Fusion-MPT SCSI BIOS Configuration Utility to set the Sync Rate to 0 (async) and the Data Width to 8. The SCSI device runs in async/narrow mode and no Domain Validation operations are performed on the SCSI device.

The integrated stripe volume Fails — The POST displays `Failed` instead of `Optimal`.

1 Ensure that the SCSI cable is properly attached to each hard drive and to the system board.
2 Ensure that the power cable is connected to each hard drive.
3 Ensure that the stripe volume drives have not been moved.

For additional assistance, see "Contacting Dell".

NOTICE: The following procedure may delete all the information that is currently on your hard drives.

If the integrated stripe volume contains the operating system and the computer does not boot:

1 Press <Ctrl><a> during system startup when the following message appears: `Press Cntl-A to start LSI Logic Configuration Utility`.
2 Access the **Array Disk** menu
3 Delete the integrated stripe volume.

If the BIOS recognizes all SCSI hard drives, enter the configuration utility and recreate the intergrate stripe volume.

If one or more the hard drives is not recognized by the BIOS or is the configuration utility does not allow the selection of one or more of the hard drives:

1 Replace the defective hard drive(s).
2 Enter the configuration utility and recreate the integrated stripe volume.

5

SECTION 6

Removing and Installing Parts—Dell Precision 650

6

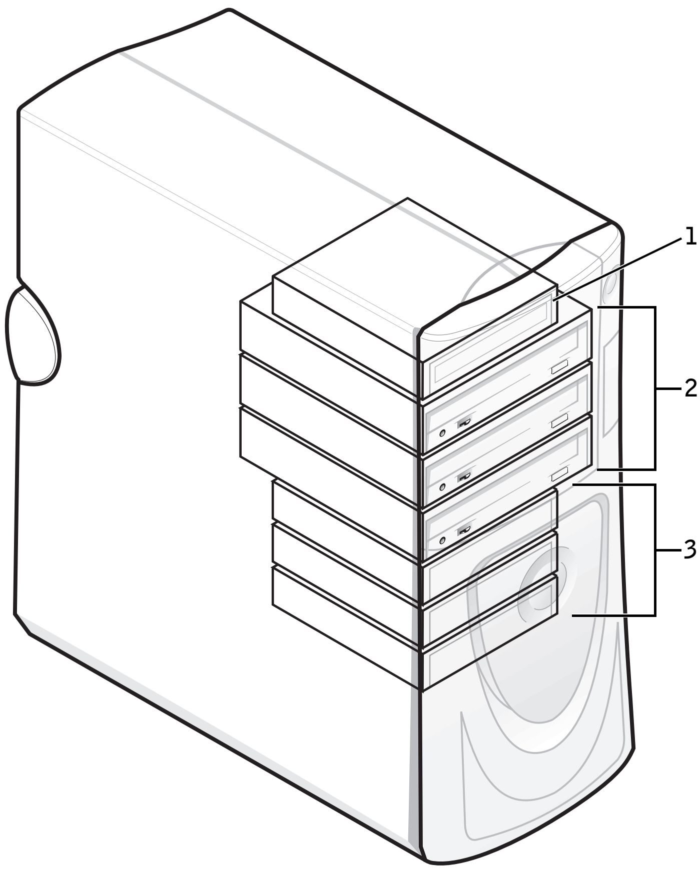
SECTION 7

Drives

Overview

Your computer supports:

- Three hard drives (Your computer supports IDE, Serial ATA, and SCSI.)
- One floppy drive
- Three CD or DVD drives (One bay may be used for additional hard drive using an add-in bay bracket.)



1	floppy drive(s)
2	CD/DVD drive(s)
3	hard drive(s)

IDE Drive Addressing

When you connect two IDE devices to a single IDE interface cable and configure them for the cable select setting, the device attached to the last connector on the interface cable is the primary (master) or boot device (drive 0), and the device attached to the middle connector on the interface cable is the secondary (slave) device (drive 1). See the drive documentation in your upgrade kit for information on configuring devices for the cable select setting.

Since cable select is the default setting, any additional drives that are installed do not need to be set as a primary or secondary drive.

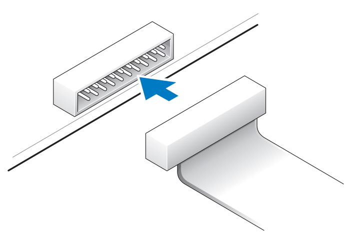
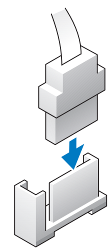
Your computer supports up to two IDE devices. Hard drives should be connected to the connector labeled "IDE1," and CD/DVD drives should be connected to the connector labeled "IDE2."

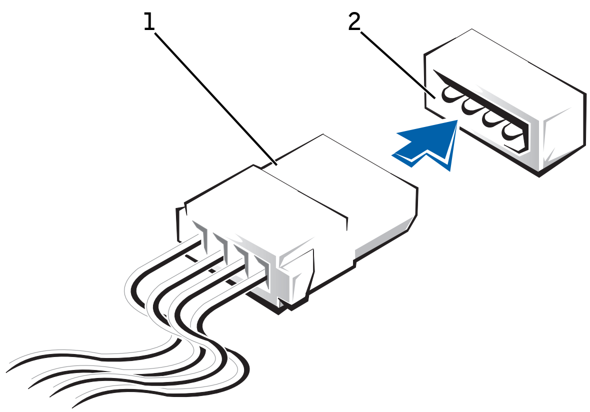
Connect serial ATA drives to the connectors labeled "SATA_0" or "SATA_1."

Connecting Drive Cables

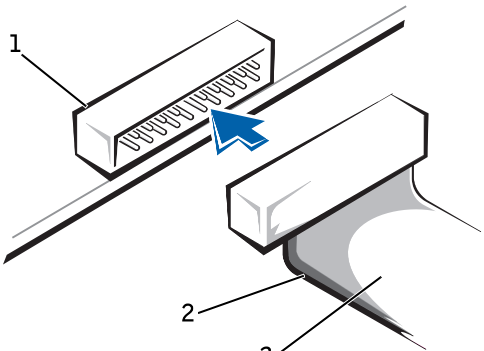
When you install a drive, you connect two cables—a DC power cable and an interface cable—to the back of the drive.

NOTICE: If your system was purchased with a Serial ATA hard drive, the system includes the newer style Serial ATA style power connector. If you are adding a Serial ATA hard drive to a system that was not originally equipped with one and the drive you are adding requires the new style Serial ATA power connector, you may need to obtain a power adapter cable from Dell. If you need a Serial ATA power adapter cable, see Contacting Dell.

IDE Drive Connector	Serial ATA Connector
	



1	power cable
2	power input connector



1	interface connector
2	colored stripe on cable
3	interface cable

Most interface connectors are keyed for correct insertion; that is, a notch or a missing pin on one connector matches a tab or a filled-in hole on the other connector. Keyed connectors ensure that the pin-1 wire in the cable (indicated by the colored stripe along one edge of the cable) goes to the pin-1 end of the connector. The pin-1 end of a connector on a board or a card is usually indicated by a silk-screened “1” printed directly on the board or card.

NOTICE: When you connect an interface cable, do not place the colored stripe away from pin 1 of the connector. Reversing the cable prevents the drive from operating and could damage the controller, the drive, or both.

SCSI Device Installation Guidelines

This section describes how to configure and install SCSI devices in your computer. To install a SCSI device, you can use one or both of the following SCSI controllers:

- The SCSI connector on the system board. To locate the SCSI system board connector, see the system board illustration (for the Dell Precision 450 computer, see "System Board Components" or for the Dell Precision 650 computer, see "System Board Components") or the interior service label.

NOTE: The system board SCSI controller supports hard drives only. Do not connect CD or DVD drives, tape drives, DAT drives, and so on.

- A SCSI controller card installed in your computer.

SCSI ID Numbers

Internal SCSI devices must have a unique SCSI ID number from 0 to 15. If you are using the SCSI connector on the system board and a SCSI controller card installed in your computer, you have two separate SCSI buses operating. Each SCSI bus has a set of SCSI ID numbers from 0 to 15.

When SCSI devices are shipped from the factory, the default SCSI ID numbers are assigned as follows:

System Board Controller		Controller Card	
Device	**ID**	**Device**	**ID**
Controller	7	Controller	7
Boot hard drive	0	Boot hard drive	0
		CD or DVD drive	5
		tape or DAT drive	6

NOTE: There is no requirement that SCSI ID numbers be assigned sequentially or that devices be attached to the cable in order by ID number. If two or more devices use the same ID, your computer may hang during POST and in SCSI BIOS.

SCSI devices installed by Dell are configured correctly during the manufacturing process. You do not need to set the SCSI ID for these SCSI devices.

If you attach additional optional SCSI devices, see the documentation for each device for information about setting the appropriate SCSI ID number.

NOTICE: Dell recommends that you use only SCSI cables purchased from Dell. Cables purchased elsewhere are not guaranteed to work with Dell computers.

Device Termination

SCSI logic requires that termination be enabled for the two devices at opposite ends of the SCSI chain and disabled for all devices in between.

It is recommended that you use terminated cables and that you disable termination on all devices. See the documentation provided with any optional SCSI device you purchase for information on disabling termination on the device.

General Guidelines

Follow these general guidelines when installing SCSI devices in your computer:

- Although you install SCSI devices essentially the same way as other devices, their configuration requirements are different. For details on configuring your particular SCSI subsystem, see the documentation for your SCSI devices and/or your host adapter card.
- Configure the device for a SCSI ID number and disable termination, if necessary.
- To use an external SCSI device, you must have a SCSI controller card installed in your computer. Connect one end of the external SCSI cable to the connector on the back of the SCSI device. Attach the other end of the external SCSI cable to the connector on the controller card installed in the computer.
- After you install a SCSI hard drive, **Primary Drive 0** and **Primary Drive 1** should be set to **None** in system setup if no EIDE hard drives are installed. If you have any EIDE devices on the second EIDE channel, such as a CD or tape drive, **Secondary Drive 0** and/or **Secondary Drive 1** should be set to **Auto**.
- You may need to use programs other than those provided with the operating system to partition and format SCSI hard drives. See the documentation that came with your SCSI software drivers for information on installing the appropriate drivers and preparing your SCSI hard drive for use.

SCSI Cables

Ultra 320, Ultra 160/m, and Ultra2/Wide LVD drives (typically hard drives) both use a 68-pin cable. One end of the cable attaches to the SCSI connector on the system board or the SCSI controller card installed in your computer. The remaining connectors on the cable attach to the various drives.

Narrow SCSI drives (tape drives, CD drives, and some hard drives) use a 50-pin cable. One end of this cable attaches to the SCSI controller card. The remaining connectors on the cable attach to the various Narrow SCSI devices.

NOTICE: Dell recommends that you use only SCSI cables purchased from Dell. Cables purchased elsewhere are not guaranteed to work with Dell computers.

Hard Drive

CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *System Information Guide*.

NOTICE: To avoid damage to the drive, do not set it on a hard surface. Instead, set the drive on a surface, such as a foam pad, that will sufficiently cushion it.

1 If you are replacing a hard drive that contains data you want to keep, back up your files before you begin this procedure.

2 Shut down the computer through the **Start** menu.

3 Ensure that your computer and attached devices are turned off. If your computer and attached devices did not automatically turn off when you shut down your computer, turn them off now.

NOTICE: To disconnect a network cable, first unplug the cable from your computer and then unplug it from the network wall jack.

4 Disconnect any telephone or telecommunication lines from the computer.

5 Disconnect your computer and all attached devices from electrical outlets, and then press the power button to ground the system board.

6 If you have installed a padlock through the padlock ring on the back panel, remove the padlock.

CAUTION: To guard against electrical shock, always unplug your computer from the electrical outlet before opening the cover.

NOTICE: Before touching anything inside your computer, ground yourself by touching an unpainted metal surface, such as the metal at the back of the computer. While you work, periodically touch an unpainted metal surface to dissipate any static electricity that could harm internal components.

7 Open the computer cover.

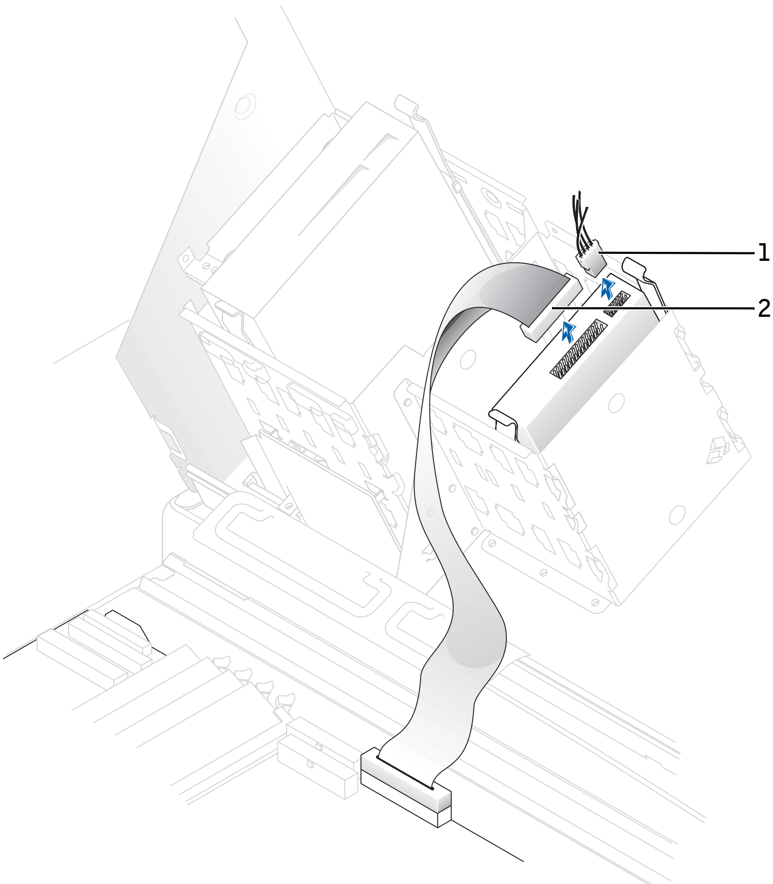
8 Ground yourself by touching an unpainted metal surface on the computer, such as the metal at the back of the computer, before touching anything inside your computer.

While you work, periodically touch an unpainted metal surface on the computer to dissipate any static electricity that might harm internal components.

Removing a Hard Drive

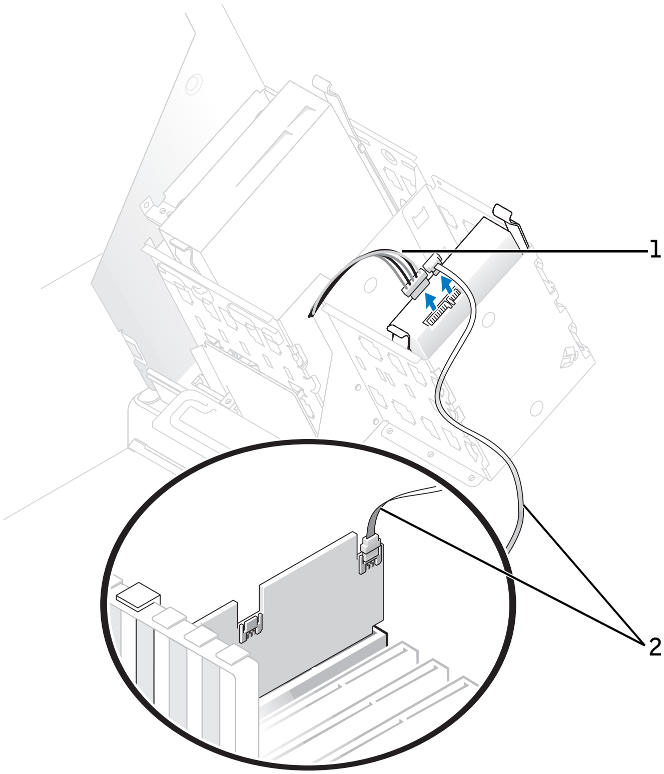
1 Disconnect the power and hard-drive cables from the drive.

IDE/SCSI Drive



1	power cable
2	hard-drive cable

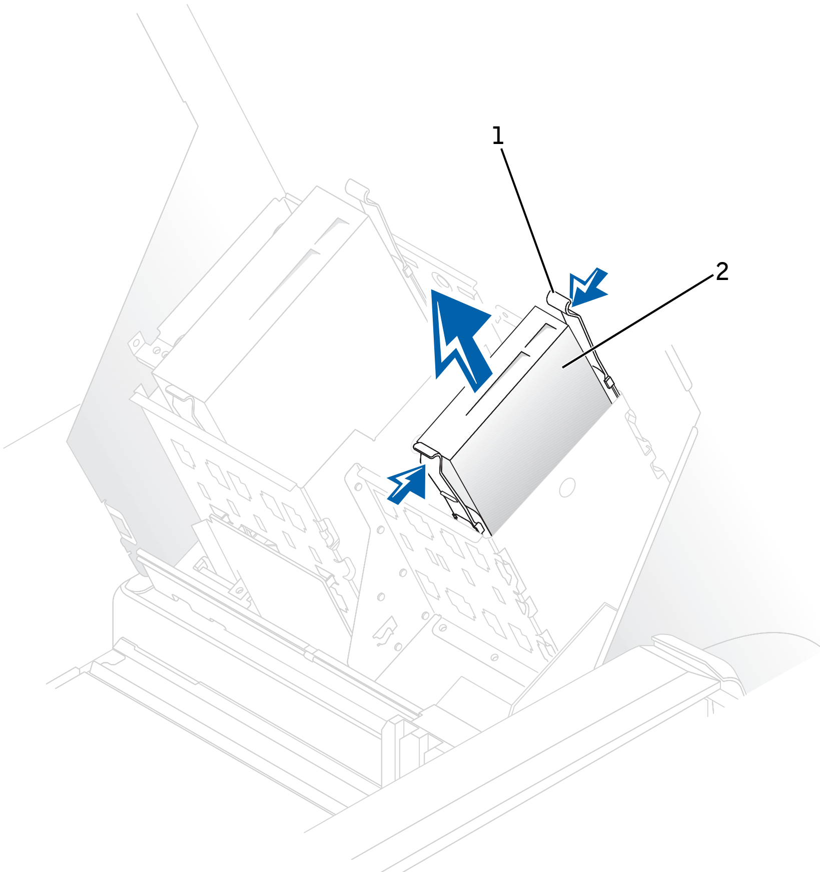
Serial ATA Drive



1	power cable
2	serial ATA hard-drive cable

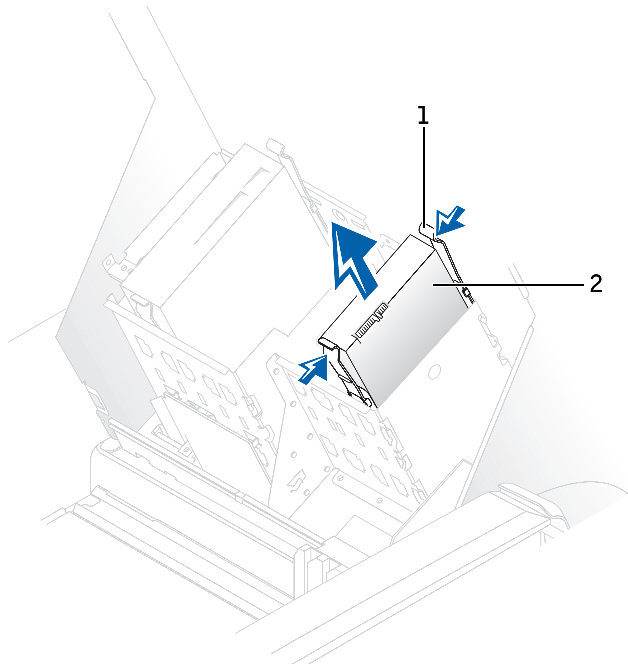
2 Press in on the tabs on each side of the drive and slide the drive up and out.

IDE/SCSI Drive



1	tab (2)	
2	hard drive	

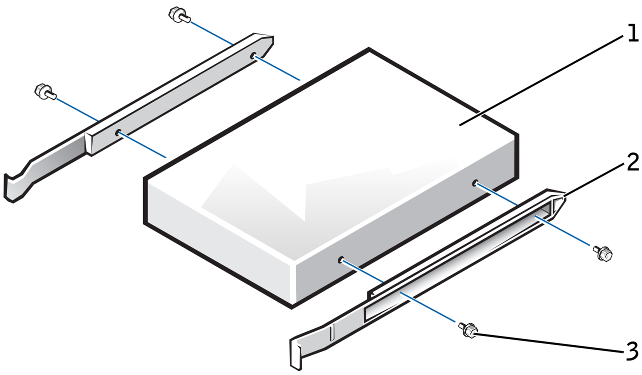
Serial ATA Drive



1	tab (2)
2	hard drive

Installing a Hard Drive

1. Unpack the replacement hard drive, and prepare it for installation.
2. Check the documentation for the drive to verify that it is configured for your computer.
3. If your replacement hard drive does not have the bracket rails attached, remove the rails from the old drive by removing the two screws that secure each rail to the drive. Attach the bracket rails to the new drive by aligning the screw holes on the drive with the screw holes on the bracket rails and then inserting and tightening all four screws (two screws on each rail).

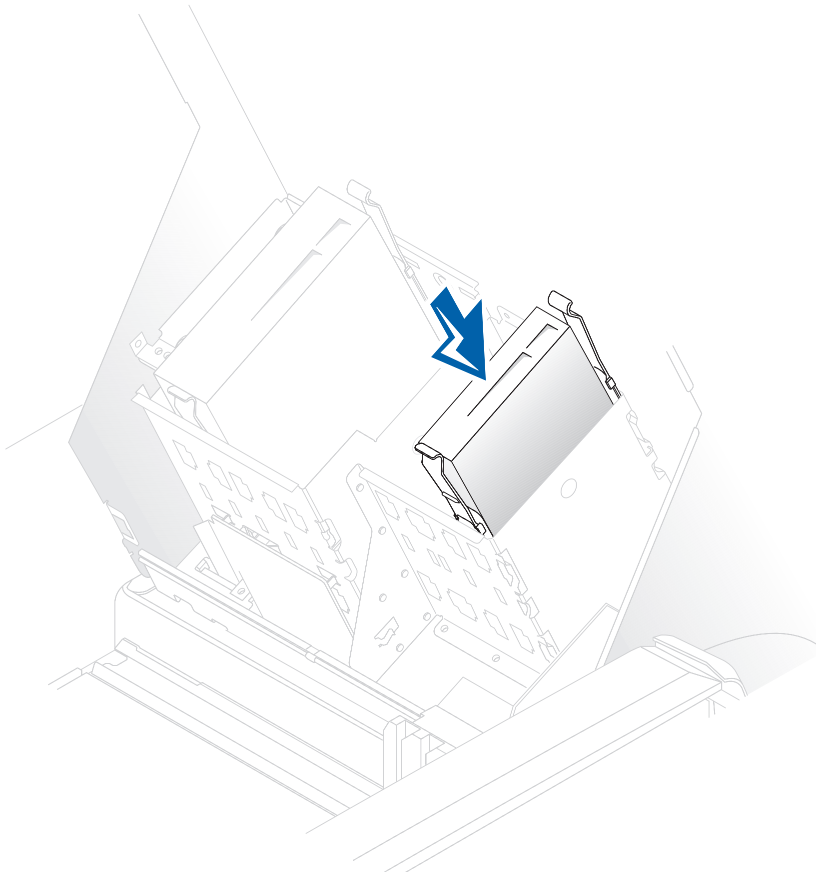


1	drive
2	bracket rails (2)
3	screws (4)

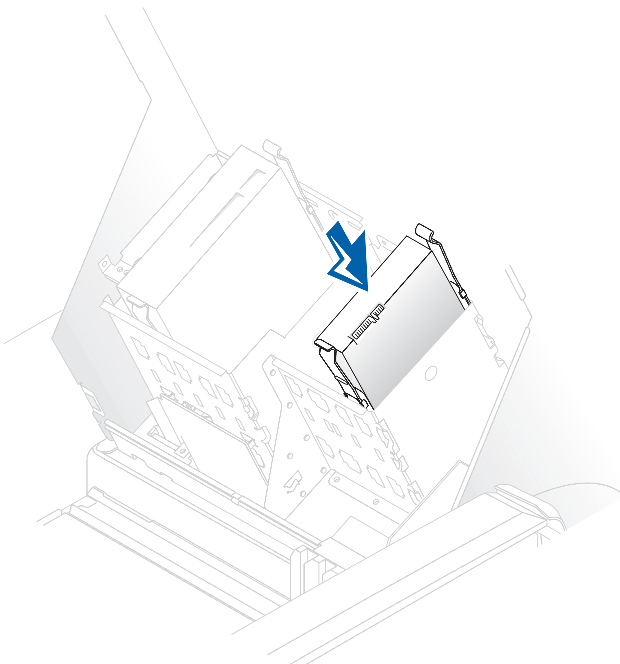
4 Gently slide the drive into place until the tabs securely click into position.

5If you are installing a hard drive in the lower bay, place the drive in the bay so that the power connector is on the left-hand side (opposite of the top hard drive).

IDE/SCSI Drive



Serial ATA Drive



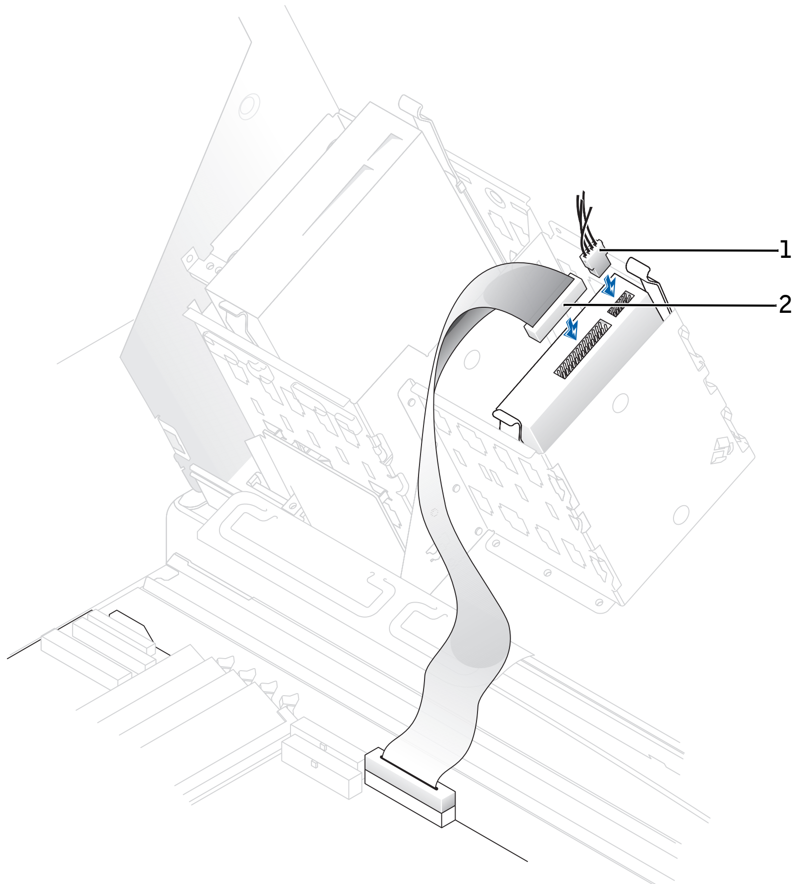
6 If you are installing a drive that has its own controller card, install the controller card in an expansion slot.

See the documentation that accompanied the drive and controller card to verify that the configuration is correct for your computer.

NOTICE: Match the colored strip on the cable with pin 1 on the drive (pin 1 is marked as "1").

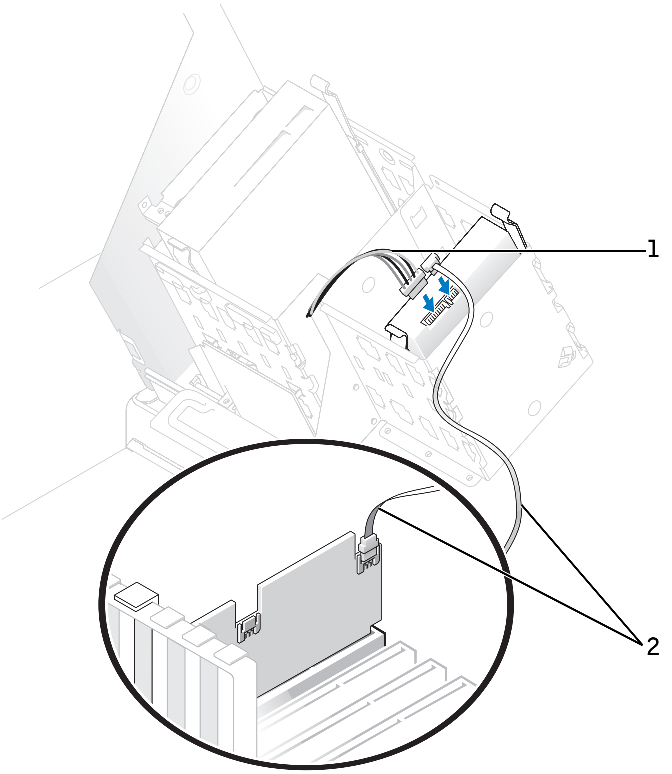
7 Connect the power and hard-drive cables to the drive.

IDE/SCSI Drive



1	power cable
2	hard-drive cable

Serial ATA Drive



1	power cable
2	serial ATA hard-drive cable

8 Check all connectors to be certain that they are properly cabled and firmly seated.

9 Close the computer cover.

NOTICE: To connect a network cable, first plug the cable into the network wall jack and then plug it into the computer.

10 Connect your computer and devices to electrical outlets, and turn them on.

See the documentation that came with the drive for instructions on installing any software required for drive operation.

11 If the drive you just installed is the primary drive, insert a bootable floppy disk into drive A.

12 Turn on the computer.

13 Enter system setup, and update the your drive configuration.

14 After you have updated the system settings, exit system setup, and restart the computer.

15 Partition and logically format your drive before you proceed to the next step.

See the documentation for your operating system for instructions.

16 Test the hard drive by running the Dell Diagnostics.

17 If the drive you just installed is the primary drive, install your operating system on the hard drive.

Floppy Drive

CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *System Information Guide*.

1 Shut down the computer through the **Start** menu.

2 Ensure that your computer and attached devices are turned off. If your computer and attached devices did not automatically turn off when you shut down your computer, turn them off now.

NOTICE: To disconnect a network cable, first unplug the cable from your computer and then unplug it from the network wall jack.

3 Disconnect any telephone or telecommunication lines from the computer.

4 Disconnect your computer and all attached devices from electrical outlets, and then press the power button to ground the system board.

5 If you have installed a padlock through the padlock ring on the back panel, remove the padlock.

CAUTION: To guard against electrical shock, always unplug your computer from the electrical outlet before opening the cover.

NOTICE: Before touching anything inside your computer, ground yourself by touching an unpainted metal surface, such as the metal at the back of the computer. While you work, periodically touch an unpainted metal surface to dissipate any static electricity that could harm internal components.

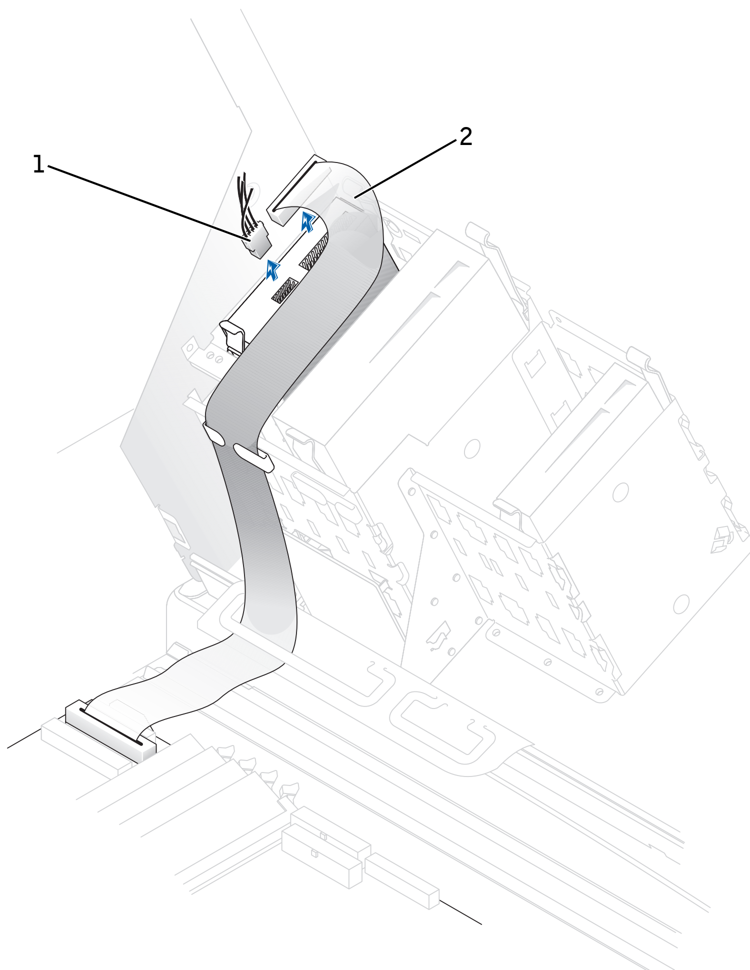
6 Open the computer cover.

7 Ground yourself by touching an unpainted metal surface on the computer, such as the metal at the back of the computer, before touching anything inside your computer.

While you work, periodically touch an unpainted metal surface on the computer to dissipate any static electricity that might harm internal components.

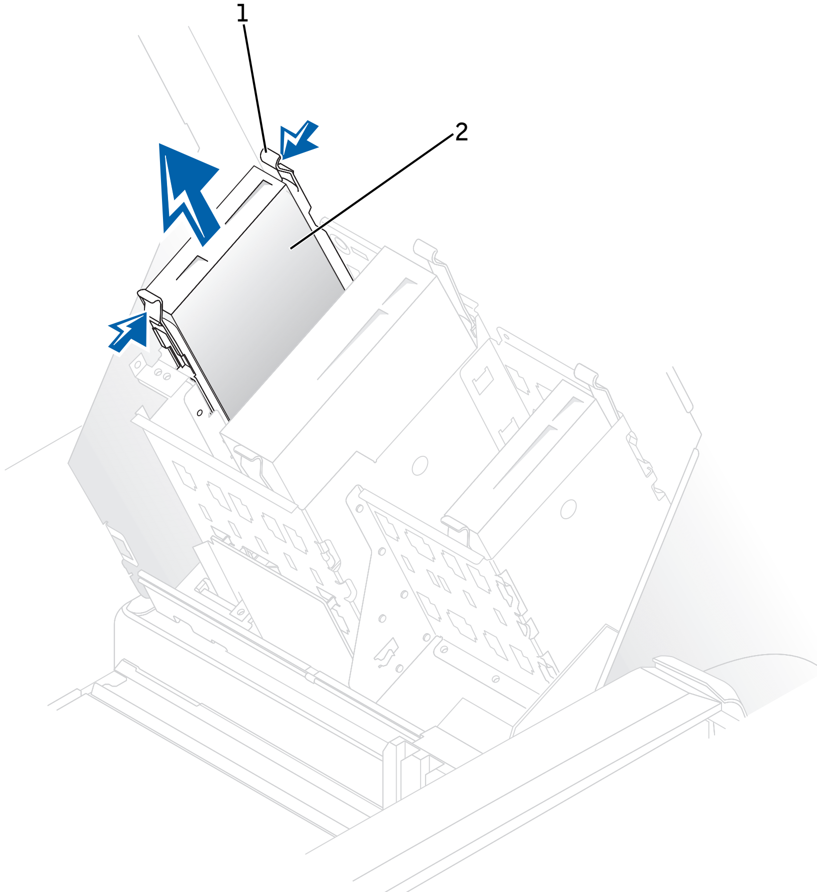
Removing a Floppy Drive

1 Disconnect the power and floppy-drive cables from the back of the floppy drive.



1	power cable
2	floppy-drive cable

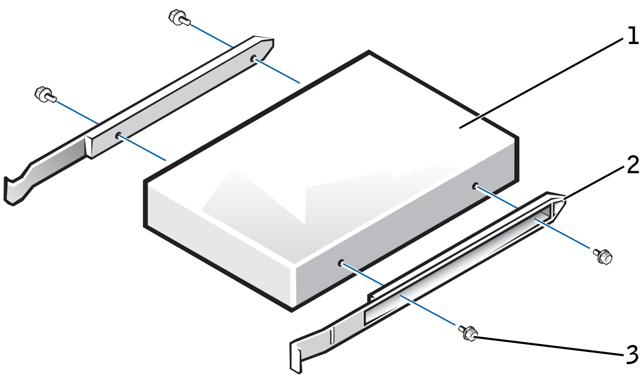
2 Press inward on the two tabs on the sides of the drive, slide the drive upward, and remove it from the floppy-drive bay.



1	tab (2)
2	floppy drive

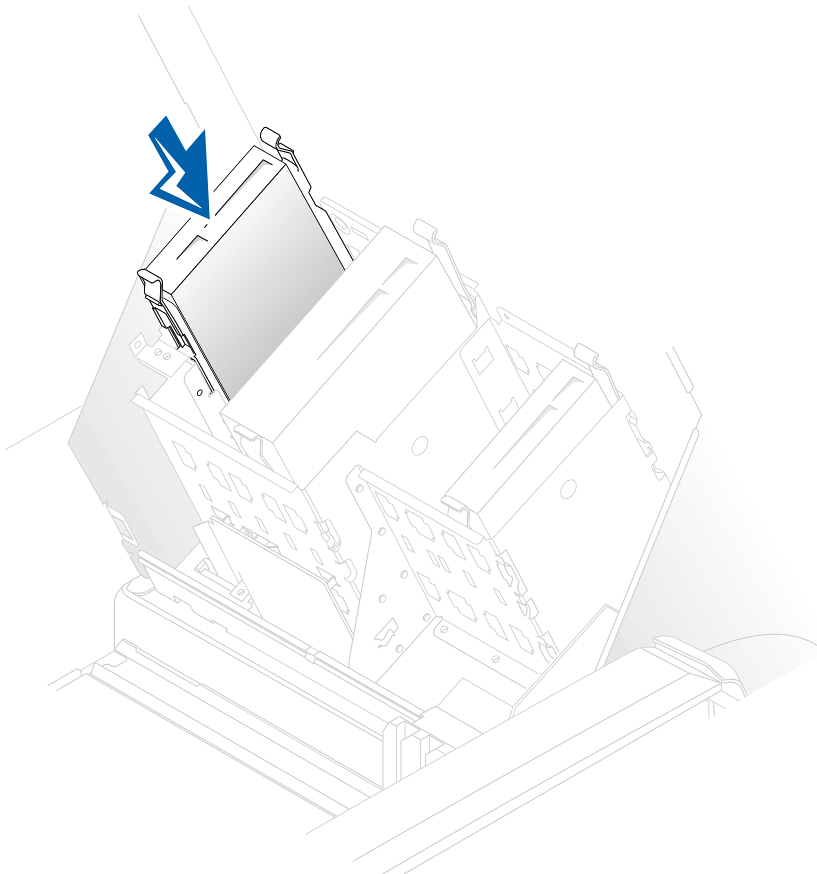
Installing a Floppy Drive

1 If you are replacing a drive and the the new drive does not have the bracket rails attached, remove the rails from the old drive by removing the two screws that secure each rail to the drive. Attach the bracket to the new drive by aligning the screw holes on the drive with the screw holes on the bracket rails and then inserting and tightening all four screws (two screws on each rail).

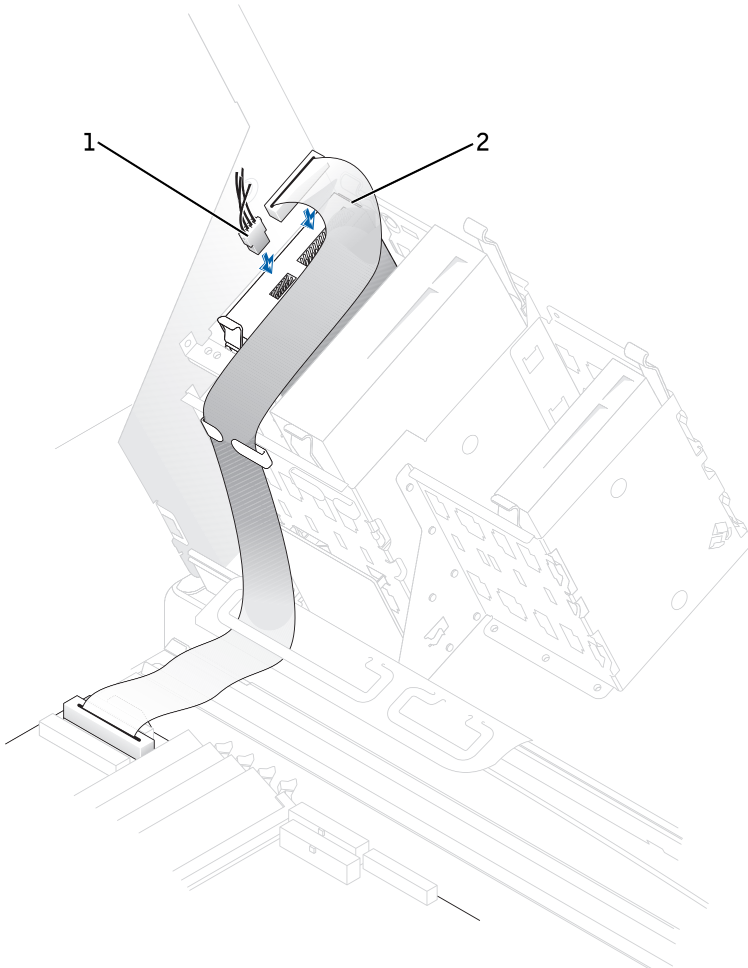


1	drive
2	bracket rails (2)
3	screws (4)

2 Gently slide the drive into place until the tabs securely click into position.



3 Attach the power and floppy-drive cables to the floppy drive.



1	power cable
2	floppy-drive cable

4 If you are installing a new floppy drive rather than replacing a drive, remove the front-panel inserts.

From inside the drive bay, gently press on each side of the insert until it pops out.

5 Check all cable connections, and fold cables out of the way to provide airflow for the fan and cooling vents.

6 Close the computer cover.

NOTICE: To connect a network cable, first plug the cable into the network wall jack and then plug it into the computer.

7 Connect your computer and devices to electrical outlets, and turn them on.

See the documentation that came with the drive for instructions on installing any software required for drive operation.

8 Enter system setup and update the appropriate **Diskette Drive A** option to reflect the size and capacity of your new floppy drive.

9 To verify that your computer works correctly, run the Dell Diagnostics.

CD/DVD Drive

CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *System Information Guide*.

1 Shut down the computer through the **Start** menu.

2 Ensure that your computer and attached devices are turned off. If your computer and attached devices did not automatically turn off when you shut down your computer, turn them off now.

NOTICE: To disconnect a network cable, first unplug the cable from your computer and then unplug it from the network wall jack.

3 Disconnect any telephone or telecommunication lines from the computer.

4 Disconnect your computer and all attached devices from electrical outlets, and then press the power button to ground the system board.

5 If you have installed a padlock through the padlock ring on the back panel, remove the padlock.

CAUTION: To guard against electrical shock, always unplug your computer from the electrical outlet before opening the cover.

NOTICE: Before touching anything inside your computer, ground yourself by touching an unpainted metal surface, such as the metal at the back of the computer. While you work, periodically touch an unpainted metal surface to dissipate any static electricity that could harm internal components.

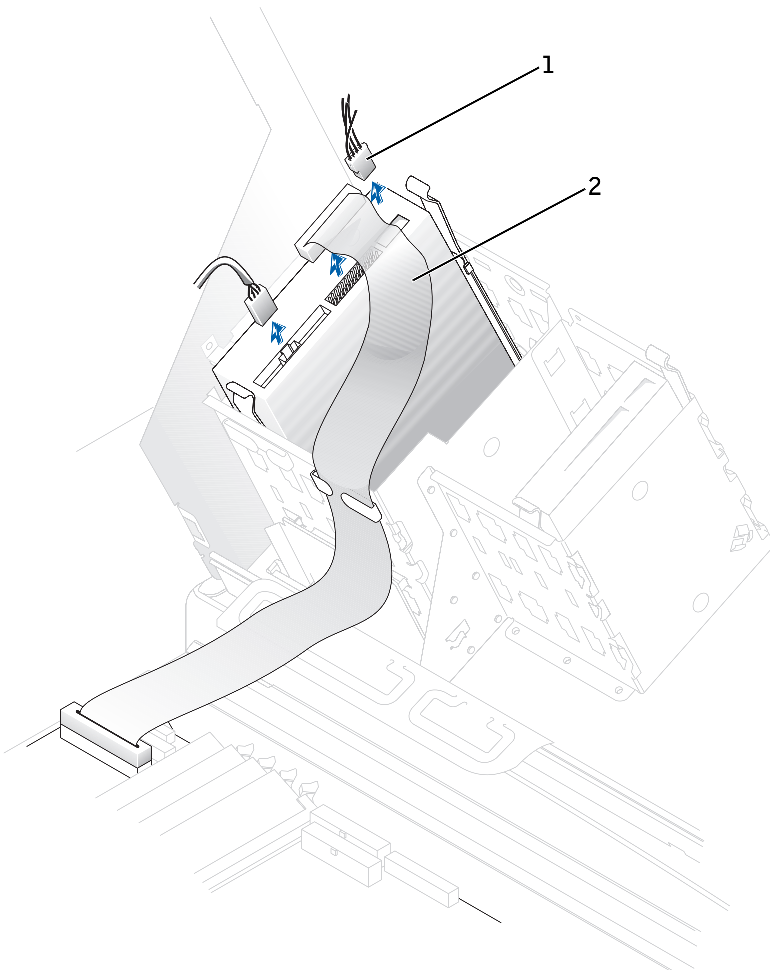
6 Open the computer cover.

7 Ground yourself by touching an unpainted metal surface on the computer, such as the metal at the back of the computer, before touching anything inside your computer.

While you work, periodically touch an unpainted metal surface on the computer to dissipate any static electricity that might harm internal components.

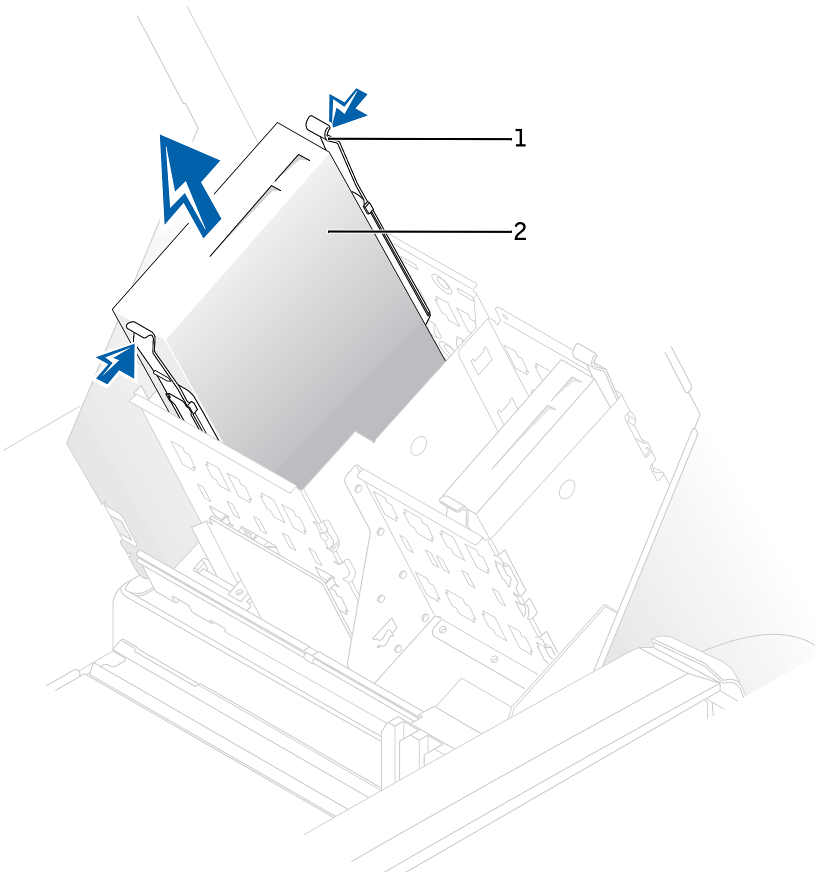
Removing a CD/DVD Drive

1 Disconnect the power and CD/DVD drive cables from the back of the drive.



1	power cable
2	CD/DVD drive cable

2 Press inward on the two tabs on the sides of the drive, and then slide the drive upward and remove it from the drive bay.



1	tab (2)
2	CD/DVD drive

Installing a CD/DVD Drive

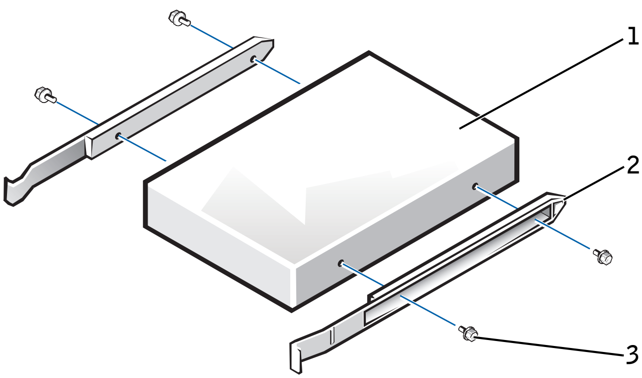
NOTE: A fourth hard drive can be added to a bay using an add-in bay bracket. To order a bracket, see Contacting Dell.

1 If you are installing a new drive, unpack the drive and prepare it for installation.

   Check the documentation that accompanied the drive to verify that the drive is configured for your computer. If you are installing an IDE drive, configure the drive for the cable select setting.

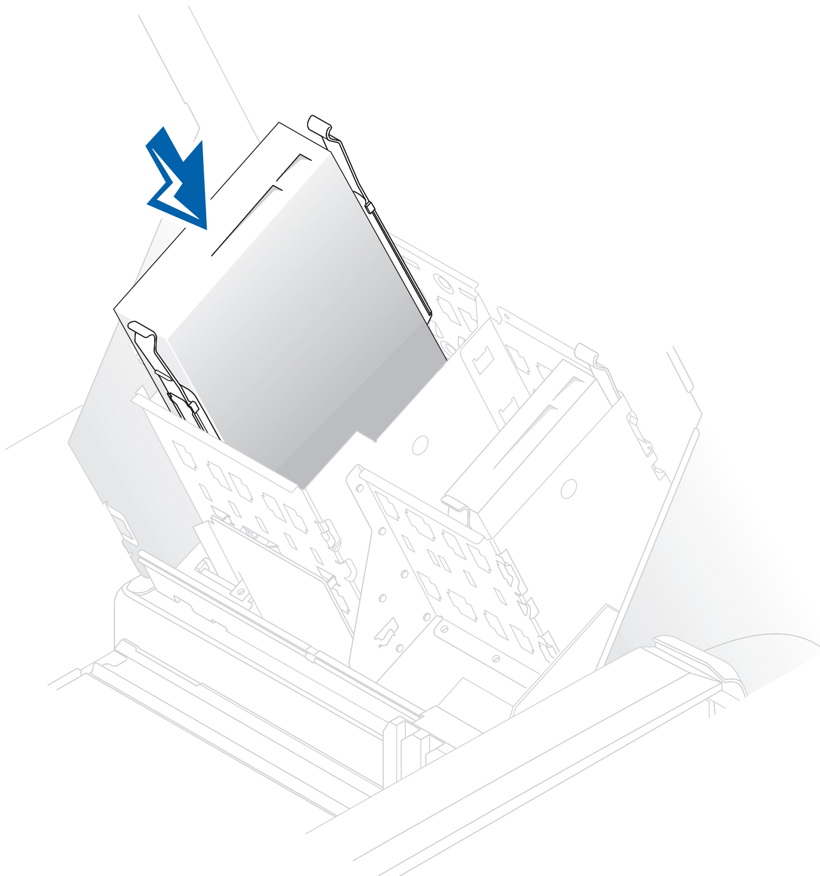
2 Connect the new drive to the set of rails that are attached to the inside of the cover. If a set of rails is not attached inside the computer cover, call Dell. See Contacting Dell.

3 If you are installing a replacement drive and the new drive does not have the bracket rails attached, remove the rails from the old drive by removing the two screws that secure each rail to the drive. Attach the bracket to the new drive by aligning the screw holes on the drive with the screw holes on the bracket rails and then inserting and tightening all four screws (two screws on each rail).



1	drive
2	bracket rails (2)
3	screws (4)

4 Gently slide the drive into place until the tabs securely click into position.

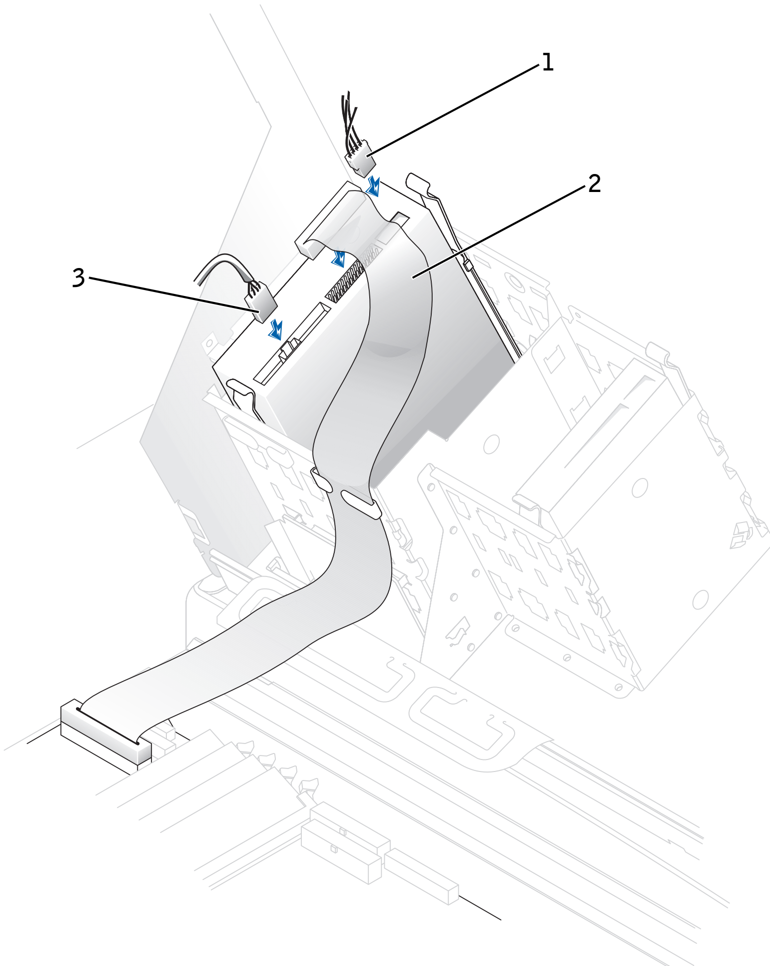


5 If you are installing a drive that has its own controller card, install the controller card in an expansion slot.

See the documentation that accompanied the drive and controller card to verify that the configuration is correct for your computer.

6 Connect the power and CD/DVD drive cables to the drive.

If you are adding a drive that has an audio cable, connect the audio cable to the audio connector on the system board.



1	power cable
2	CD/DVD drive cable
3	audio cable (some drives do not have this cable)

7 If you are installing a new CD/DVD drive rather than replacing a drive, remove the front-panel inserts.

From inside the drive bay, gently press on each side of the insert until it pops out.

8 Check all cable connections, and fold cables out of the way to provide airflow for the fan and cooling vents.

9 Close the computer cover.

NOTICE: To connect a network cable, first plug the cable into the network wall jack and then plug it into the computer.

10 Connect your computer and devices to electrical outlets, and turn them on.

See the documentation that came with the drive for instructions on installing any software required for drive operation.

11 Update your configuration information by setting the appropriate **Drive** option (**0 or 1**) under **Drives**: **Secondary** to **Auto**. See "Primary Drive n and Secondary Drive n" for more information.

12 Verify that your computer works correctly by running the Dell Diagnostics.

SECTION 8

Microprocessor Airflow Shroud

Removing the Microprocessor Airflow Shroud

CAUTION: Before you perform this procedure, follow the safety instructions in the *System Information Guide*.

1. Shut down the computer through the **Start** menu.
2. Ensure that your computer and attached devices are turned off. If your computer and attached devices did not automatically turn off when you shut down your computer, turn them off now.

NOTICE: To disconnect a network cable, first unplug the cable from your computer and then unplug it from the network wall jack.

3. Disconnect any telephone or telecommunication lines from the computer.
4. Disconnect your computer and all attached devices from electrical outlets, and then press the power button to ground the system board.
5. If you have installed a padlock through the padlock ring on the back panel, remove the padlock.

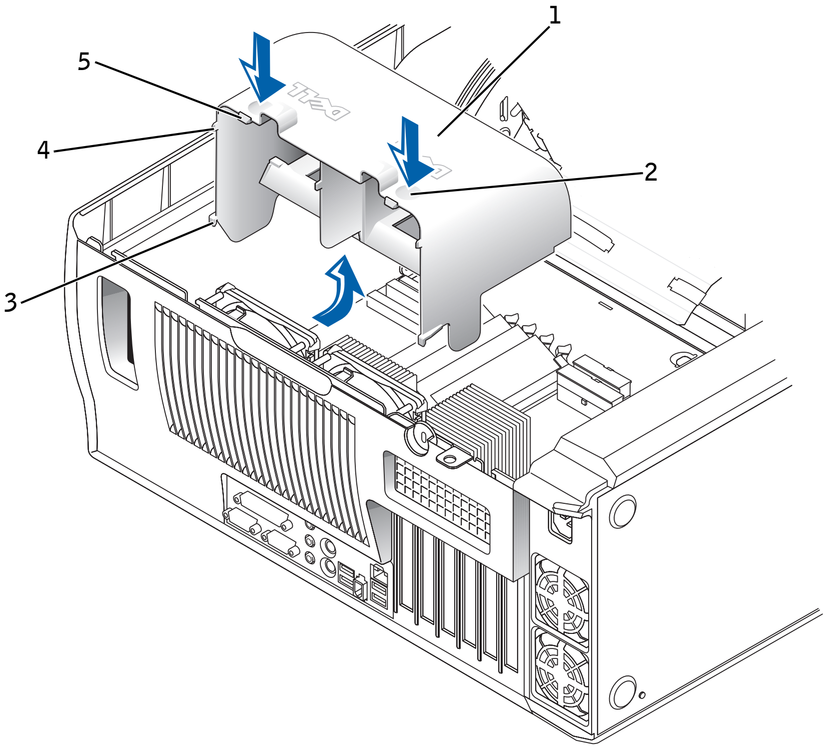
CAUTION: To guard against electrical shock, always unplug your computer from the electrical outlet before opening the cover.

NOTICE: Before touching anything inside your computer, ground yourself by touching an unpainted metal surface, such as the metal at the back of the computer. While you work, periodically touch an unpainted metal surface to dissipate any static electricity that could harm internal components.

6. Open the computer cover.
7. Ground yourself by touching an unpainted metal surface on the computer, such as the metal at the back of the computer, before touching anything inside your computer.

   While you work, periodically touch an unpainted metal surface on the computer to dissipate any static electricity that might harm internal components.
8. Press down and back on the indentations at the top corners of the shroud.

   The top anchor tabs disengage from the anchor slots.
9. Lift the airflow shroud out of the chassis.



1	airflow shroud
2	indentations (2)
3	bottom anchor tabs (2)
4	side anchor tabs (2)
5	top anchor tabs (2)

Installing the Microprocessor Airflow Shroud

1. Insert the bottom anchor tabs into the anchor slots.
2. Align and insert the side anchor tabs into the anchor slots.

3 Press the indentations until the top anchor tabs on the shroud snap securely into place.

4 Close the computer cover.

NOTICE: To connect a network cable, first plug the cable into the network wall jack and then plug it into the computer.

5 Connect your computer and devices to electrical outlets, and turn them on.

8

SECTION 9

Removing and Installing Parts—Dell Precision 450

9

SECTION 10

Opening the Computer Cover

CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *System Information Guide*.

1 Shut down the computer through the **Start** menu.

2 Ensure that your computer and attached devices are turned off. If your computer and attached devices did not automatically turn off when you shut down your computer, turn them off now.

NOTICE: To disconnect a network cable, first unplug the cable from your computer and then unplug it from the network wall jack.

3 Disconnect any telephone or telecommunication lines from the computer.

4 Disconnect your computer and all attached devices from electrical outlets, and then press the power button to ground the system board.

5 If you have installed a padlock through the padlock ring on the back panel, remove the padlock.

CAUTION: To guard against electrical shock, always unplug your computer from the electrical outlet before opening the cover.

6 Lay the computer on its side as shown in the illustration.

NOTICE: Ensure that sufficient space exists to accommodate the open cover—at least 30 cm (1 ft) of desk top space.

7 Open the computer cover:

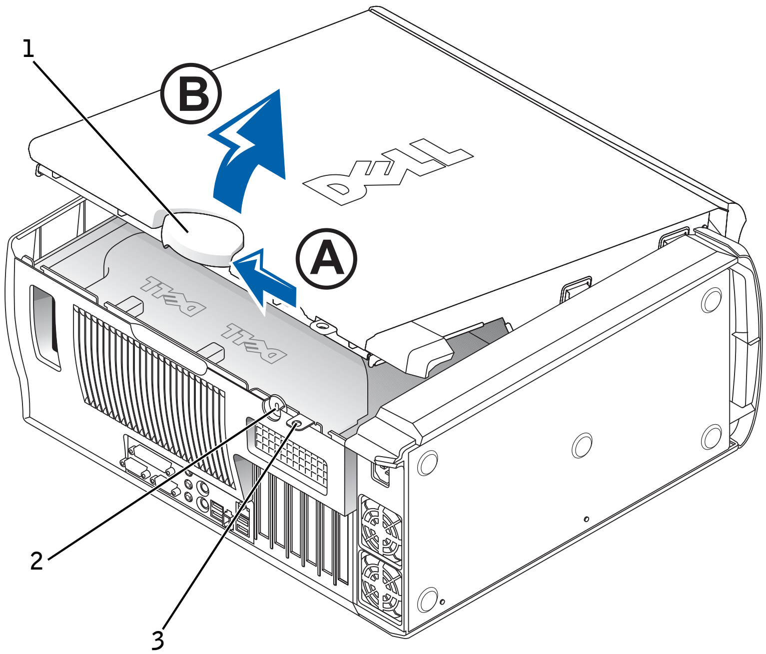
a Slide the cover release latch toward the top of the computer.

b Raise the cover, and pivot it toward the front of the computer.

8 Ground yourself by touching an unpainted metal surface on the computer, such as the metal at the back of computer, before touching anything inside your computer.

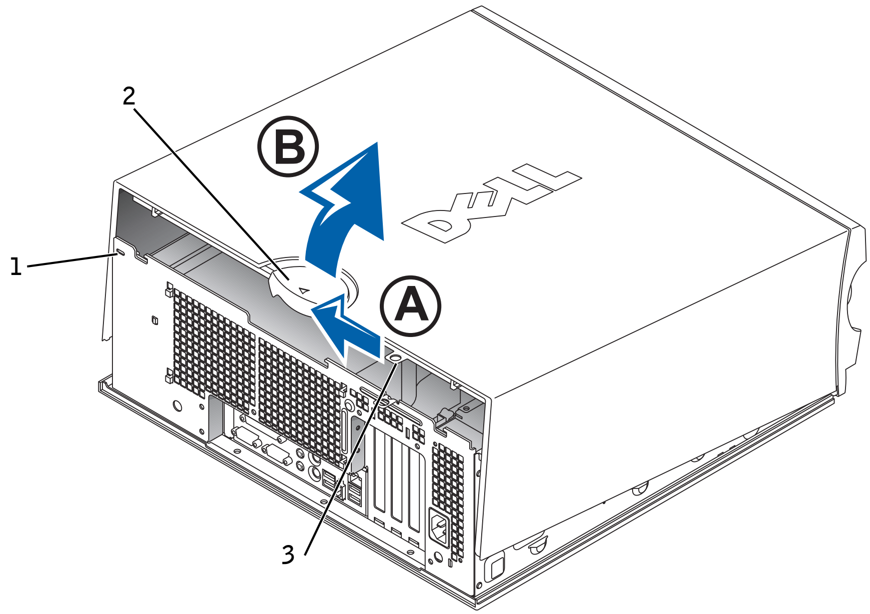
While you work, periodically touch any unpainted metal surface on the computer to dissipate any static electricity that could harm internal components.

Dell Precision 650



1	cover release latch
2	security cable slot
3	padlock ring

Dell Precision 450



1	security cable slot
2	cover release latch
3	padlock ring

10

SECTION 11

Memory

⚠ **CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *System Information Guide*.**

You can increase your computer memory by installing memory modules on the system board. For information on the type of memory supported by your computer, see "Specifications."

1. Shut down the computer through the **Start** menu.
2. Ensure that your computer and attached devices are turned off. If your computer and attached devices did not automatically turn off when you shut down your computer, turn them off now.

NOTICE: To disconnect a network cable, first unplug the cable from your computer and then unplug it from the network wall jack.

3. Disconnect any telephone or telecommunication lines from the computer.
4. Disconnect your computer and all attached devices from electrical outlets, and then press the power button to ground the system board.
5. If you have installed a padlock through the padlock ring on the back panel, remove the padlock.

⚠ **CAUTION: To guard against electrical shock, always unplug your computer from the electrical outlet before opening the cover.**

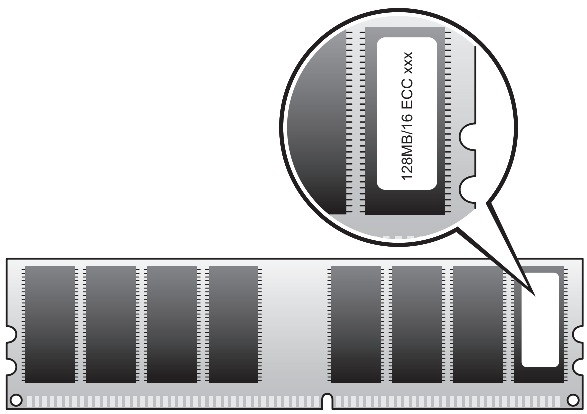
NOTICE: Before touching anything inside your computer, ground yourself by touching an unpainted metal surface, such as the metal at the back of the computer. While you work, periodically touch an unpainted metal surface to dissipate any static electricity that could harm internal components.

6. Open the computer cover.

Memory Installation Guidelines

- Memory module connectors must be upgraded in matched pairs. Memory module connectors 1 and 2 must contain modules of identical size, type, speed, and number of chips and memory module connectors 3 and 4 must contain modules of identical size, type, speed, and number of chips. To locate the memory sockets on the system board, see the system board components illustration (for the Dell Precision 450 computer, see "System Board Components" or for the Dell Precision 650 computer, see "System Board Components") or the system board label inside your computer.
- Before you install new memory modules, download the most recent BIOS for your computer from the Dell Support website at **support.dell.com**.

Memory Module Label



Addressing Memory With 4-GB Configurations

Your computer supports a maximum of 4GB of memory when using four 1-GB DIMMs. Current operating systems, such as Microsoft® Windows® 2000 and Windows XP, can only utilize a maximum of 4 GB of address space; however, the amount of memory available to the operating system is slightly less than 4 GB. Certain components within the computer require address space in the 4-GB range. Any address space reserved for these components cannot be used by computer memory. The following is a list of components that require memory address space:

- System ROM
- APIC(s)
- Integrated PCI devices, such as network connector, SCSI controller, and IEEE 1394 controller

- PCI and AGP cards
- The AGP Aperture size specified in system setup

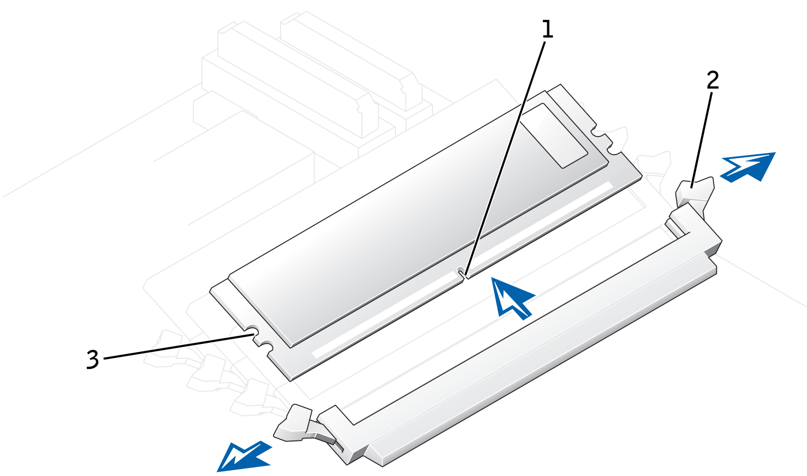
At start-up the BIOS identifies the components that require address space. The BIOS dynamically calculates the amount of reserved address space required. It then subtracts the reserved address space from 4 GB to determine the amount of usable space.

- If the total installed computer memory is less than the usable space, all installed computer memory is available for use only by the operating system.
- If the total installed computer memory is equal to or greater than the usable address space, a small portion of installed memory is available for use by the operating system.

Removing a Memory Module

1. Press down and outward on the securing clips.
2. Grasp the module and pull up.

   If the module is difficult to remove, gently ease the module back and forth to remove it from the connector.

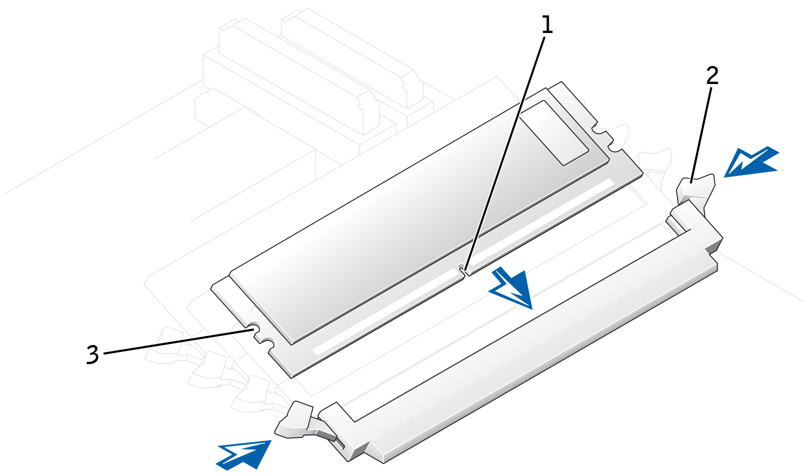


1	notch
2	memory module securing clips (2)
3	alignment keys

Adding a Memory Module

1. Press out the securing clip at each end of the memory module connector.
2. Align the notch on the bottom of the module with the crossbar in the connector.
3. Insert the module into the connector, ensuring that it fits into the guides at each end of the connector. Carefully press each end of the module into place.

   The memory module socket has alignment keys that allow the memory module to be installed in the socket only one way.



1	notch
2	memory module securing clips (2)
3	alignment keys

4. Pull up on the securing clips to lock the modules into place.

   If you insert the module correctly, the securing clips snap into the cutouts at each end of the module.

   When the memory module is properly seated in the socket, the securing clips on the memory module socket should align with the securing clips on the other sockets with memory modules installed.
5. Close the computer cover.

NOTICE: To connect a network cable, first plug the cable into the network wall jack and then plug it into the computer.

6 Connect your computer and devices to electrical outlets, and turn them on.

The computer detects that the new memory does not match the existing configuration information and generates the following message:

```
The amount of system memory has changed.
Strike the F1 key to continue, F2 to run the setup utility
```

7 Press <F2> to enter system setup and check the value for **System Memory**.

The computer should have changed the value of **System Memory** to reflect the newly installed memory. Verify the new total. If it is correct, skip to step 10.

8 If the memory total is incorrect, turn off and disconnect your computer and devices from electrical outlets.

9 Open the computer cover and check the installed memory modules to ensure that they are seated properly in their sockets. Then repeat steps step 4 through step 7.

10 When the **System Memory** total is correct, press <Esc> to exit system setup.

11 Run the Dell Diagnostics to verify that the memory modules are operating properly.

11

SECTION 12

Cards

Cards

Your Dell™ computer provides slots for PCI/PCI-X and AGP cards. For more information, see "Specifications" or the system board components illustration for your computer.

NOTE: To meet PC99 requirements, your Dell computer uses only PCI slots. ISA cards are not supported.

If you are installing or replacing a card, follow the procedures in the next section. If you are removing but not replacing a card, see "Removing a Card."

1 Shut down the computer through the **Start** menu.
2 Ensure that your computer and attached devices are turned off. If your computer and attached devices did not automatically turn off when you shut down your computer, turn them off now.

NOTICE: To disconnect a network cable, first unplug the cable from your computer and then unplug it from the network wall jack.

3 Disconnect any telephone or telecommunication lines from the computer.
4 Disconnect your computer and all attached devices from electrical outlets, and then press the power button to ground the system board.
5 If you have installed a padlock through the padlock ring on the back panel, remove the padlock.

CAUTION: To guard against electrical shock, always unplug your computer from the electrical outlet before opening the cover.

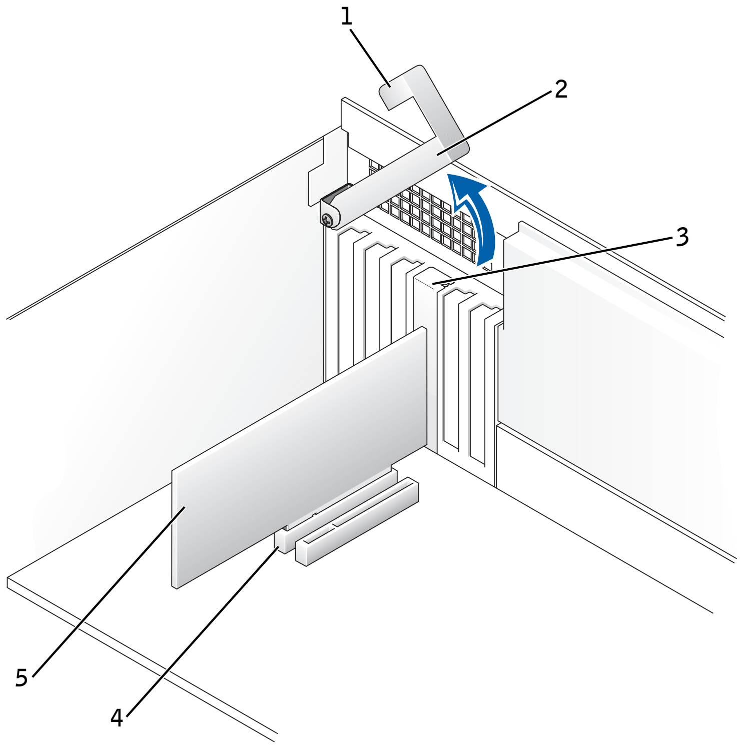
NOTICE: Before touching anything inside your computer, ground yourself by touching an unpainted metal surface, such as the metal at the back of the computer. While you work, periodically touch an unpainted metal surface to dissipate any static electricity that could harm internal components.

6 Open the computer cover.

Installing a Card

CAUTION: Before you perform this procedure, follow the safety instructions in the *System Information Guide*.

1 Press the lever on the card retention arm and raise the retention arm.



1	lever
2	retention arm
3	card bracket
4	card connector
5	card

2 If you are installing a new card, remove the filler bracket to create a card-slot opening. Then continue with step 4.

3 If you are replacing a card that is already installed in the computer, remove the card.

If necessary, disconnect any cables connected to the card. Grasp the card by its top corners, and ease it out of its connector.

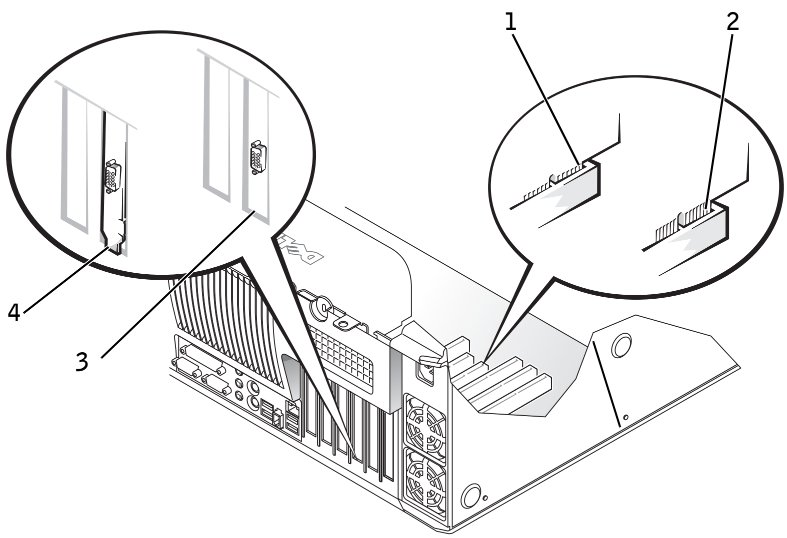
4 Prepare the card for installation.

See the documentation that came with the card for information on configuring the card, making internal connections, or otherwise customizing it for your computer.

CAUTION: Some network connectors automatically start the computer when they are connected to a network. To guard against electrical shock, be sure to unplug your computer from its electrical outlet before installing any cards. Verify that the standby power light on the system board is off. To locate this light, see the system board illustration (for the Dell Precision 450 computer, see"System Board Components" or for the Dell Precision 650 computer, see "System Board Components").

5 Place the card in the connector and press down firmly. Ensure that the card is fully seated in the slot.

If the card is full-length, insert the end of the card into the card guide bracket as you lower the card toward its connector on the system board. Insert the card firmly into the card connector on the system board.

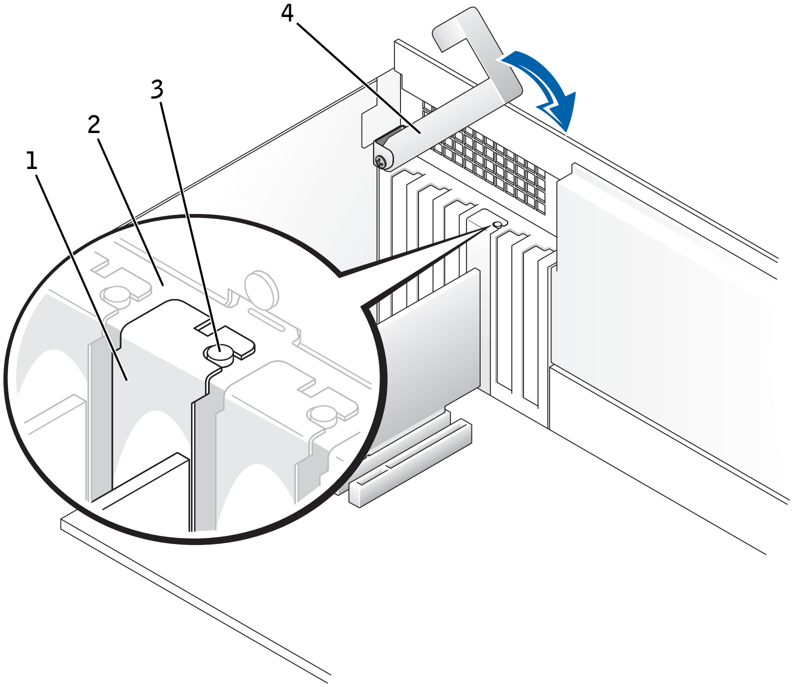


1	fully seated card
2	not fully seated card
3	bracket within slot
4	bracket caught outside of slot

6 Before you lower the retention arm, ensure that:

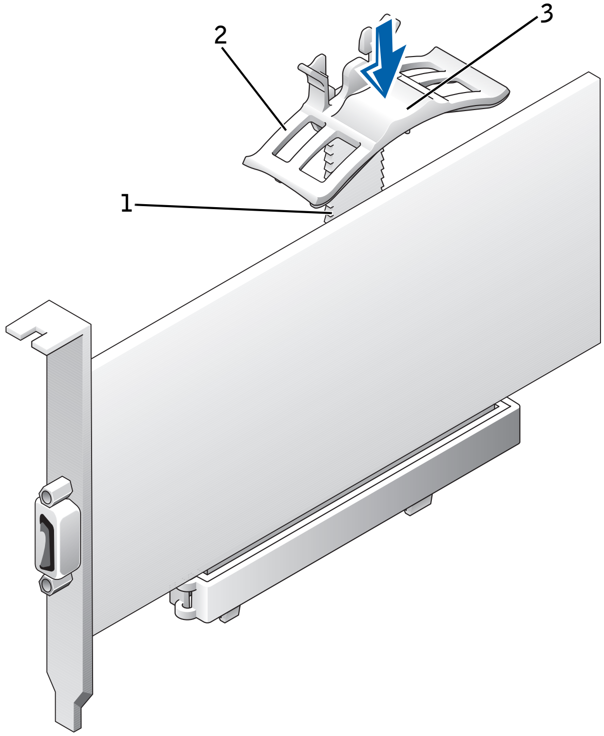
- The tops of all cards and filler brackets are flush with the alignment bar
- The notch in the top of the card or filler bracket fits around the alignment guide

Press the arm into place, securing the card(s) in the computer.



1	filler bracket
2	alignment bar
3	alignment guide
4	retention arm

7 If you are replacing an AGP card, align the AGP card guide with the base and press down on the indentation until the guide stops at the top of the AGP card.



1	base
2	AGP retention spring
3	indentation

NOTICE: Do not route card cables over or behind the cards. Cables routed over the cards can prevent the computer cover from closing properly or cause damage to the equipment.

8 Connect any cables that should be attached to the card.

See the documentation for the card for information about the card's cable connections.

NOTICE: To connect a network cable, first plug the cable into the network wall jack and then plug it into the computer.

9 Close the computer cover, reconnect the computer and devices to electrical outlets, and turn them on.

10 If you installed a sound card:

a Enter system setup, select **Integrated Devices**, and change the setting for **Sound** to **Off**.

b Connect external audio devices to the sound card's connectors. Do not connect external audio devices to the microphone, speaker/headphone, or line-in connectors on the back panel (for the Dell Precision 450 computer, see "Back View" or for the Dell Precision 650 computer, see "Back View").

11 If you installed an add-in network connector:

a Enter system setup, select **Integrated Devices,** and change the setting for **Network Interface Card** to **Off**.

b Connect the network cable to the add-in network connector's connectors. Do not connect the network cable to the integrated connector on the back panel.

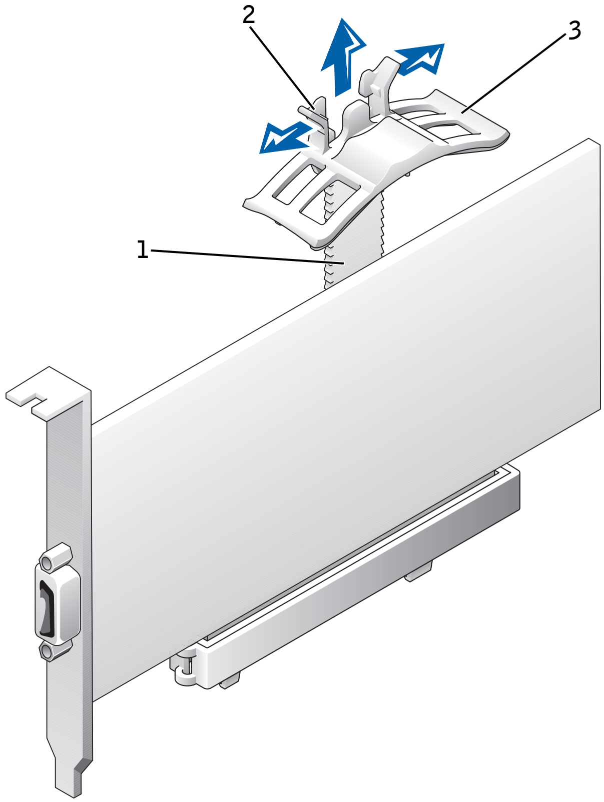
12 Install any drivers required for the card as described in the card documentation.

Removing a Card

CAUTION: Before you perform this procedure, follow the safety instructions in the *System Information Guide*.

1 Press the lever on the card retention arm and raise the retention arm (see "Installing a Card").

2 If you are removing an AGP card, press out on the release tabs and pull the AGP card guide up and off of the base.



1	base
2	release tabs (2)
3	AGP retention spring

3 If necessary, disconnect any cables connected to the card.

4 Grasp the card by its top corners, and ease it out of its connector.

5 If you are removing the card permanently, install a filler bracket in the empty card-slot opening.

If you need a filler bracket, contact Dell.

NOTE: Installing filler brackets over empty card-slot openings is necessary to maintain FCC certification of the computer. The brackets also keep dust and dirt out of your computer.

6 Lower the retention arm and press it into place, securing the card(s) in the computer.

NOTICE: To connect a network cable, first plug the cable into the network wall jack and then plug it into the computer.

7. Close the computer cover, reconnect the computer and devices to electrical outlets, and turn them on.
8. Remove the card's driver from the operating system.
9. If you removed a sound card:
   a. Enter system setup, select **Integrated Devices**, and change the setting for **Sound** to **On**.
   b. Connect external audio devices to the audio connectors on the computer back panel (for the Dell Precision 450 computer, see "Back View" or for the Dell Precision 650 computer, see "Back View").
10. If you removed an add-in network connector:
    a. Enter system setup, select **Integrated Devices,** and change the setting for **Network Interface Card** to **On**.
11. Connect the network cable to the integrated connector on the computer back panel (for the Dell Precision 450 computer, see "Back View" or for the Dell Precision 650 computer, see "Back View").

SECTION 13

Drives

Overview

Hard Drive

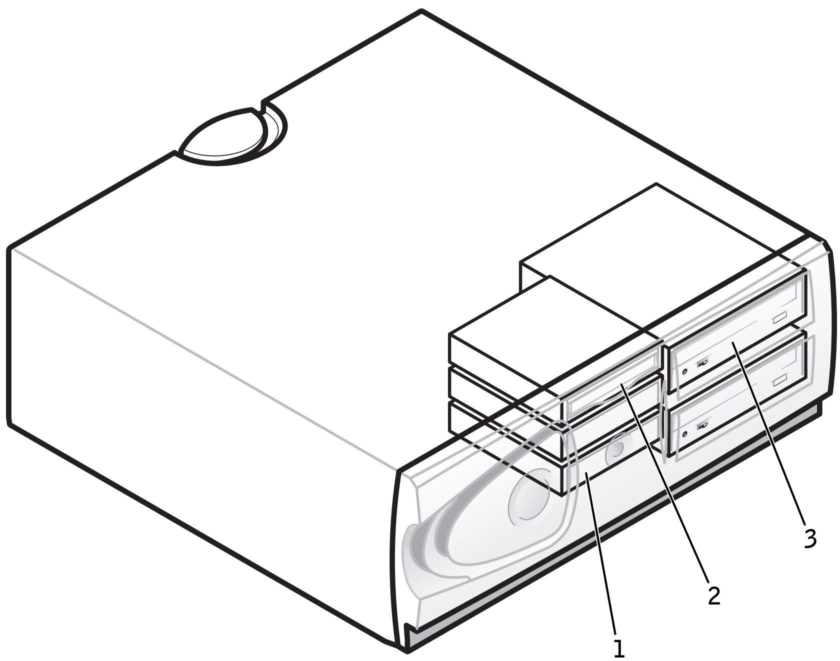
Floppy Drive

CD/DVD Drive

Overview

Your computer supports:

- Two hard drives (Your computer supports SCSI with an add-in controller, IDE, and Serial ATA.)
- One floppy drive
- Two CD or DVD drives



1	hard drive(s)
2	floppy drive(s)
3	CD/DVD drives(s)

IDE Drive Addressing

When you connect two IDE devices to a single IDE interface cable and configure them for the cable select setting, the device attached to the last connector on the interface cable is the primary (master) or boot device (drive 0), and the device attached to the middle connector on the interface cable is the secondary (slave) device (drive 1). See the drive documentation in your upgrade kit for information on configuring devices for the cable select setting.

Since cable select is the default setting, any additional drives that are installed do not need to be set as a primary or secondary drive.

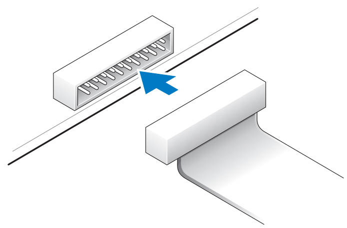
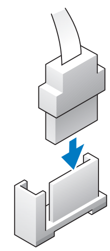
Your computer supports up to two IDE devices. Hard drives should be connected to the connector labeled “IDE1,” and CD/DVD drives should be connected to the connector labeled “IDE2.”

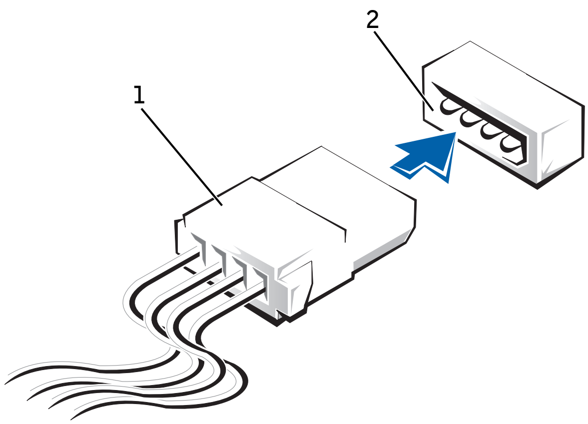
Connect serial ATA drives to the connectors labeled “SATA_0” or “SATA_1.”

Connecting Drive Cables

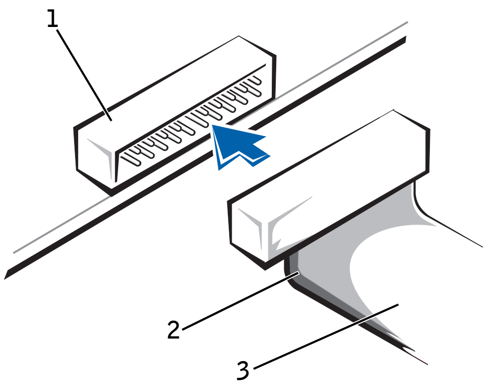
When you install a drive, you connect two cables—a DC power cable and an interface cable—to the back of the drive.

NOTICE: If your system was purchased with a Serial ATA hard drive, the system includes the newer style Serial ATA style power connector. If you are adding a Serial ATA hard drive to a system that was not originally equipped with one and the drive you are adding requires the new style Serial ATA power connector, you may need to obtain a power adapter cable from Dell. If you need a Serial ATA power adapter cable, see Contacting Dell for the number to call for assistance.

IDE Drive Connector	Serial ATA Connector
	



1	power cable
2	power input connector



1	interface connector
2	colored stripe on cable
3	interface cable

Most interface connectors are keyed for correct insertion; that is, a notch or a missing pin on one connector matches a tab or a filled-in hole on the other connector. Keyed connectors ensure that the pin-1 wire in the cable (indicated by the colored stripe along one edge of the cable) goes to the pin-1 end of the connector. The pin-1 end of a connector on a board or a card is usually indicated by a silk-screened "1" printed directly on the board or card.

NOTICE: When you connect an interface cable, do not place the colored stripe away from pin 1 of the connector. Reversing the cable prevents the drive from operating and could damage the controller, the drive, or both.

SCSI Device Installation Guidelines

This section describes how to configure and install SCSI devices in your computer.

NOTE: The system board SCSI controller supports hard drives only. Do not connect CD or DVD drives, tape drives, DAT drives, and so on.

SCSI ID Numbers

Internal SCSI devices must have a unique SCSI ID number from 0 to 15. If you are using the SCSI connector on the system board and a SCSI controller card installed in your computer, you have two separate SCSI buses operating. Each SCSI bus has a set of SCSI ID numbers from 0 to 15.

When SCSI devices are shipped from the factory, the default SCSI ID numbers are assigned as follows:

System Board Controller		Controller Card	
Device	**ID**	**Device**	**ID**
Controller	7	Controller	7
Boot hard drive	0	Boot hard drive	0
		CD or DVD drive	5
		tape or DAT drive	6

NOTE: There is no requirement that SCSI ID numbers be assigned sequentially or that devices be attached to the cable in order by ID number. If two or more devices use the same ID, your computer may hang during POST and in SCSI BIOS.

SCSI devices installed by Dell are configured correctly during the manufacturing process. You do not need to set the SCSI ID for these SCSI devices.

If you attach additional optional SCSI devices, see the documentation for each device for information about setting the appropriate SCSI ID number.

NOTICE: Dell recommends that you use only SCSI cables purchased from Dell. Cables purchased elsewhere are not guaranteed to work with Dell computers.

Device Termination

SCSI logic requires that termination be enabled for the two devices at opposite ends of the SCSI chain and disabled for all devices in between.

It is recommended that you use terminated cables and that you disable termination on all devices. See the documentation provided with any optional SCSI device you purchase for information on disabling termination on the device.

General Guidelines

Follow these general guidelines when installing SCSI devices in your computer:

- Although you install SCSI devices essentially the same way as other devices, their configuration requirements are different. For details on configuring your particular SCSI subsystem, see the documentation for your SCSI devices and/or your host adapter card.

- Configure the device for a SCSI ID number and disable termination, if necessary.
- To use an external SCSI device, you must have a SCSI controller card installed in your computer. Connect one end of the external SCSI cable to the connector on the back of the SCSI device. Attach the other end of the external SCSI cable to the connector on the controller card installed in the computer.
- After you install a SCSI hard drive, **Primary Drive 0** and **Primary Drive 1** should be set to **None** in system setup if no EIDE hard drives are installed. If you have any EIDE devices on the second EIDE channel, such as a CD or tape drive, **Secondary Drive 0** and/or **Secondary Drive 1** should be set to **Auto**.
- You may need to use programs other than those provided with the operating system to partition and format SCSI hard drives. See the documentation that came with your SCSI software drivers for information on installing the appropriate drivers and preparing your SCSI hard drive for use.

SCSI Cables

Ultra 320 (optional on the Dell Precision 450 computer), Ultra 160/m and Ultra2/Wide LVD drives (typically hard drives) both use a 68-pin cable. One end of the cable attaches to the SCSI connector on the system board or the SCSI controller card installed in your computer. The remaining connectors on the cable attach to the various drives.

Narrow SCSI drives (tape drives, CD drives, and some hard drives) use a 50-pin cable. One end of this cable attaches to the SCSI controller card. The remaining connectors on the cable attach to the various Narrow SCSI devices.

NOTICE: Dell recommends that you use only SCSI cables purchased from Dell. Cables purchased elsewhere are not guaranteed to work with Dell computers.

Hard Drive

CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *System Information Guide*.

NOTICE: To avoid damage to the drive, do not set it on a hard surface. Instead, set the drive on a surface, such as a foam pad, that will sufficiently cushion it.

1 If you are replacing a hard drive that contains data you want to keep, back up your files before you begin this procedure.

2 Shut down the computer through the **Start** menu.

3 Ensure that your computer and attached devices are turned off. If your computer and attached devices did not automatically turn off when you shut down your computer, turn them off now.

NOTICE: To disconnect a network cable, first unplug the cable from your computer and then unplug it from the network wall jack.

4 Disconnect any telephone or telecommunication lines from the computer.

5 Disconnect your computer and all attached devices from electrical outlets, and then press the power button to ground the system board.

6 If you have installed a padlock through the padlock ring on the back panel, remove the padlock.

CAUTION: To guard against electrical shock, always unplug your computer from the electrical outlet before opening the cover.

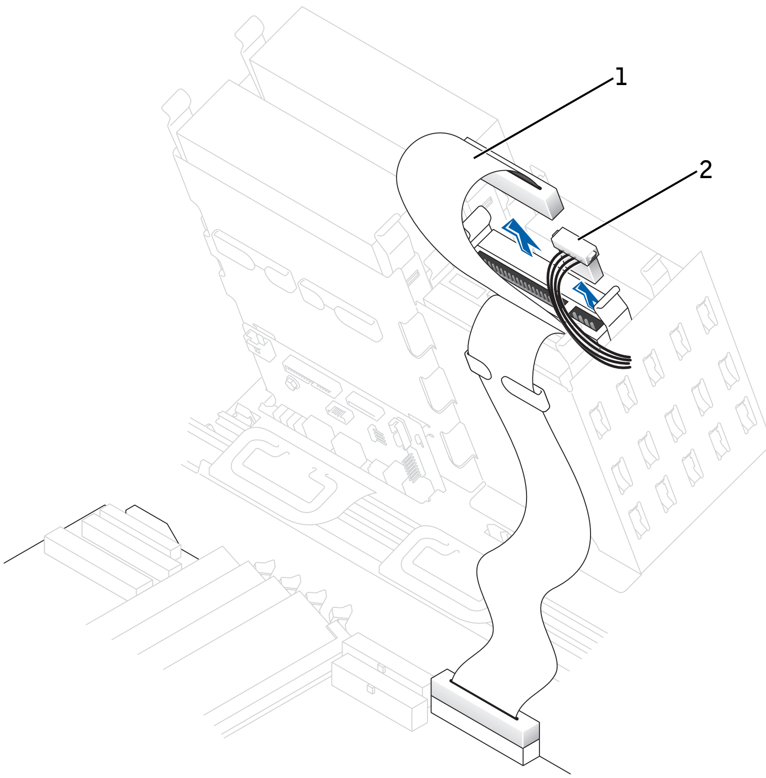
NOTICE: Before touching anything inside your computer, ground yourself by touching an unpainted metal surface, such as the metal at the back of the computer. While you work, periodically touch an unpainted metal surface to dissipate any static electricity that could harm internal components.

7 Open the computer cover.

Removing a Hard Drive

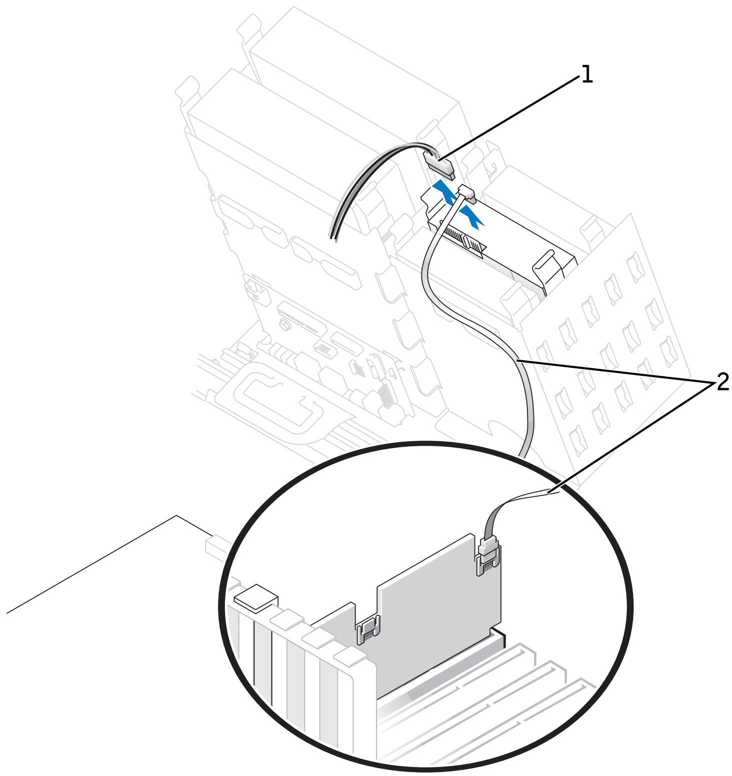
1 Disconnect the power and hard-drive cables from the drive.

IDE/SCSI Drive



1	hard-drive cable
2	power cable

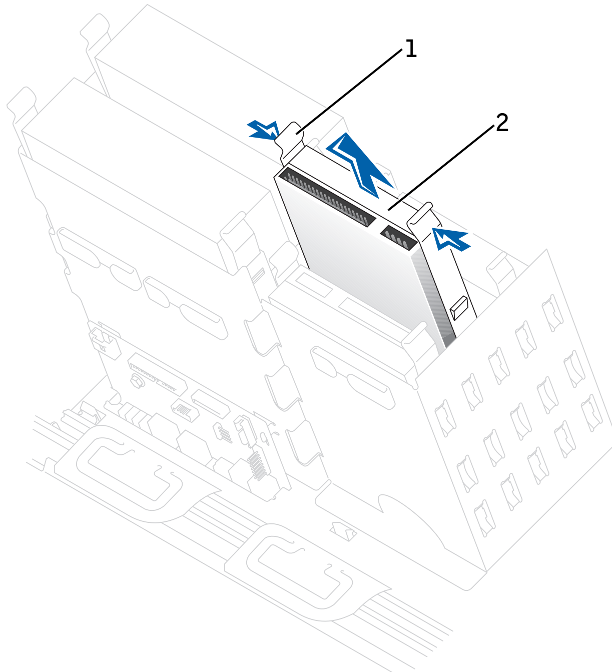
Serial ATA Drive



1	power cable
2	serial ATA hard-drive cable

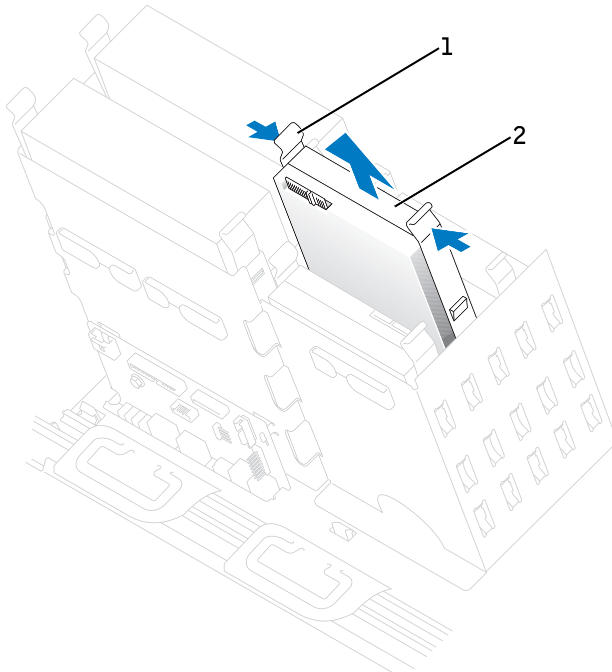
2 Press in on the tabs on each side of the drive and slide the drive up and out.

IDE/SCSI Drive



1	tab (2)
2	hard drive

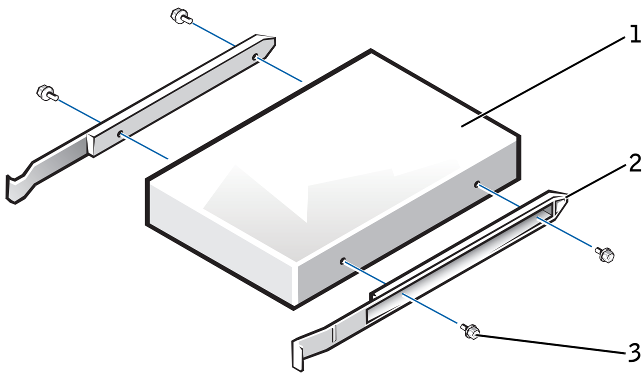
Serial ATA Drive



1	tab (2)
2	hard drive

Installing a Hard Drive

1. Unpack the replacement hard drive, and prepare it for installation.
2. Check the documentation for the drive to verify that it is configured for your computer.
3. If your replacement hard drive does not have the bracket rails attached, remove the rails from the old drive by removing the two screws that secure each rail to the drive. Attach the bracket rails to the new drive by aligning the screw holes on the drive with the screw holes on the bracket rails and then inserting and tightening all four screws (two screws on each rail).

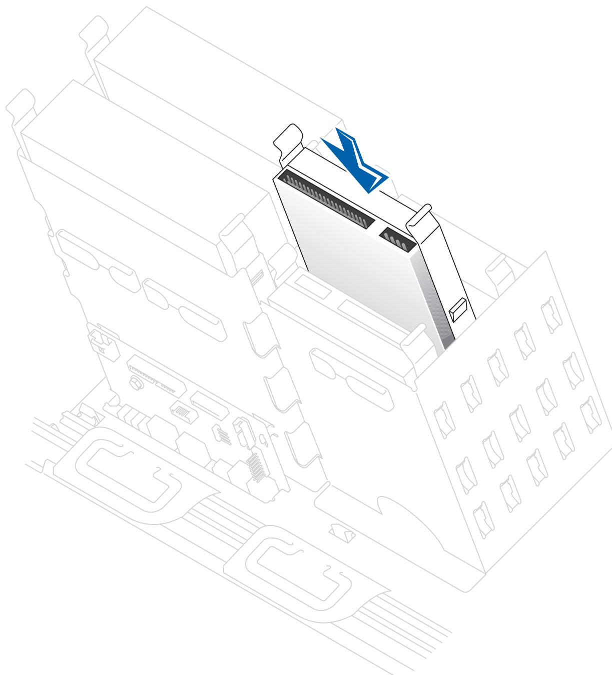


1	drive
2	bracket rails (2)
3	screws (4)

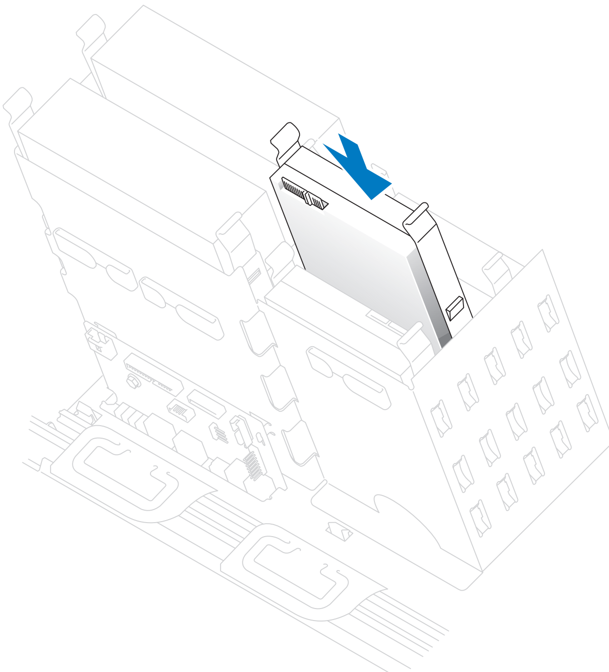
4 Gently slide the drive into place until the tabs securely click into position.

NOTE: If you are installing a hard drive in the lower bay, the drive should be placed in the bay so that the power connector is on the left-hand side (opposite of the top hard drive).

IDE/SCSI Drive



Serial ATA Drive



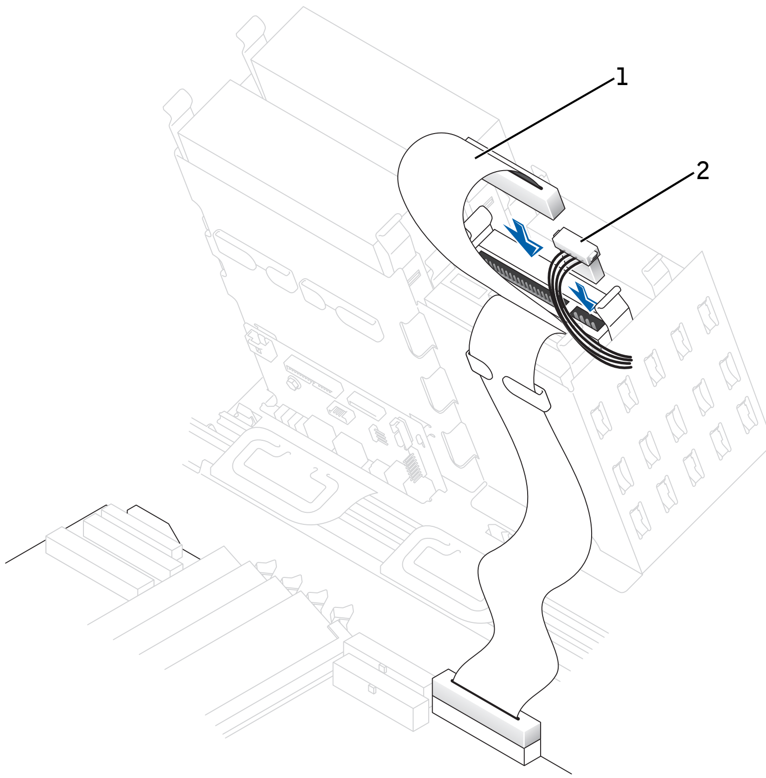
5 If you are installing a drive that has its own controller card, install the controller card in an expansion slot.

See the documentation that accompanied the drive and controller card to verify that the configuration is correct for your computer.

NOTICE: Match the colored strip on the cable with pin 1 on the drive (pin 1 is marked as "1").

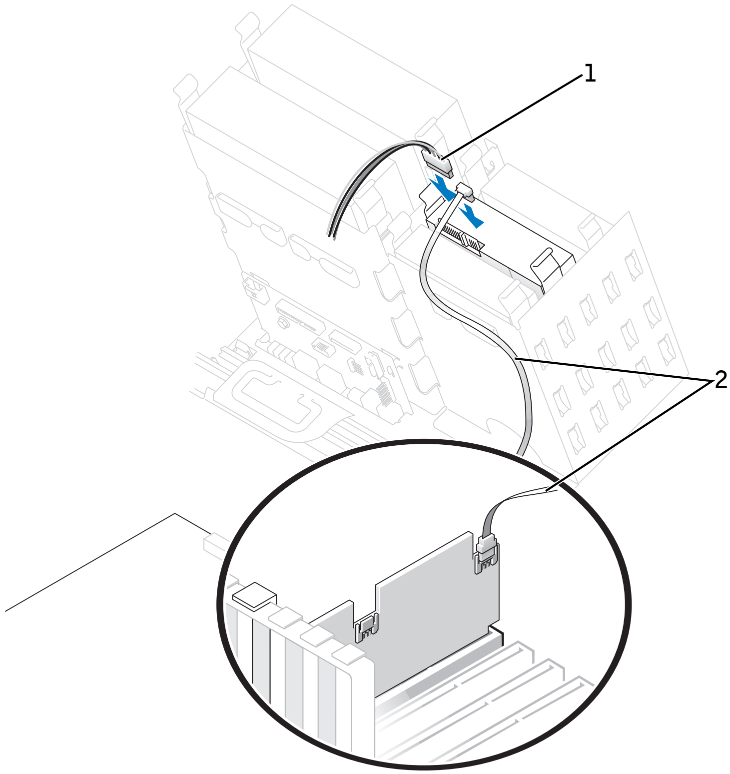
6 Connect the power and hard-drive cables to the drive.

IDE/SCSI Drive



1	hard-drive cable
2	power cable

Serial ATA Drive



1	power cable
2	serial ATA hard-drive cable

7 Check all connectors to be certain that they are properly cabled and firmly seated.

8 Close the computer cover.

NOTICE: To connect a network cable, first plug the cable into the network wall jack and then plug it into the computer.

9 Connect your computer and devices to electrical outlets, and turn them on.

See the documentation that came with the drive for instructions on installing any software required for drive operation.

10 If the drive you just installed is the primary drive, insert a bootable floppy disk into drive A.

11 Turn on the computer.

12 Enter system setup, and update the your drive configuration.

13 After you have updated the system settings, exit system setup, and restart the computer.

14 Partition and logically format your drive before you proceed to the next step.

See the documentation for your operating system for instructions.

15 Test the hard drive by running the Dell Diagnostics.

16 If the drive you just installed is the primary drive, install your operating system on the hard drive.

Floppy Drive

CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *System Information Guide*.

1 Shut down the computer through the **Start** menu.

2 Ensure that your computer and attached devices are turned off. If your computer and attached devices did not automatically turn off when you shut down your computer, turn them off now.

NOTICE: To disconnect a network cable, first unplug the cable from your computer and then unplug it from the network wall jack.

3 Disconnect any telephone or telecommunication lines from the computer.

4 Disconnect your computer and all attached devices from electrical outlets, and then press the power button to ground the system board.

5 If you have installed a padlock through the padlock ring on the back panel, remove the padlock.

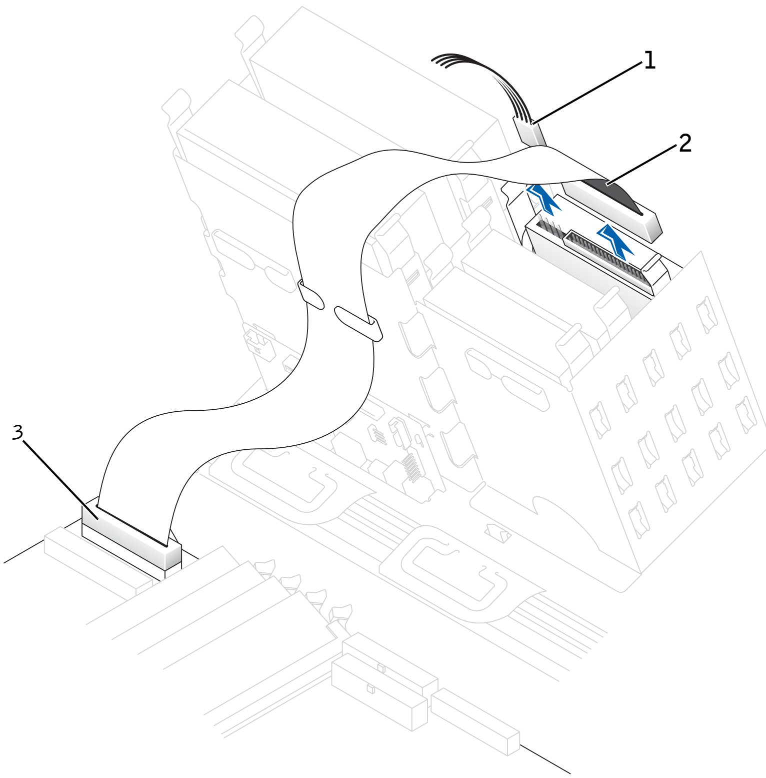
CAUTION: To guard against electrical shock, always unplug your computer from the electrical outlet before opening the cover.

NOTICE: Before touching anything inside your computer, ground yourself by touching an unpainted metal surface, such as the metal at the back of the computer. While you work, periodically touch an unpainted metal surface to dissipate any static electricity that could harm internal components.

6 Open the computer cover.

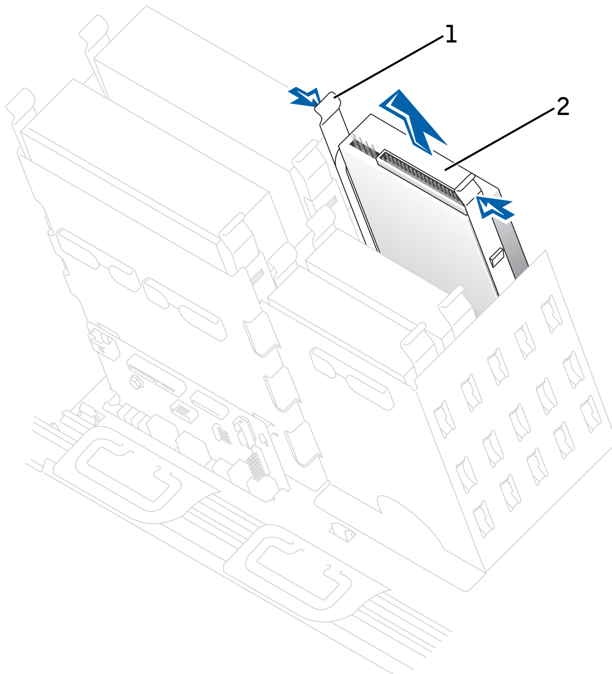
Removing a Floppy Drive

1 Disconnect the power and floppy-drive cables from the back of the floppy drive.



1	power cable
2	floppy-drive cable
3	floppy-drive connector (DSKT)

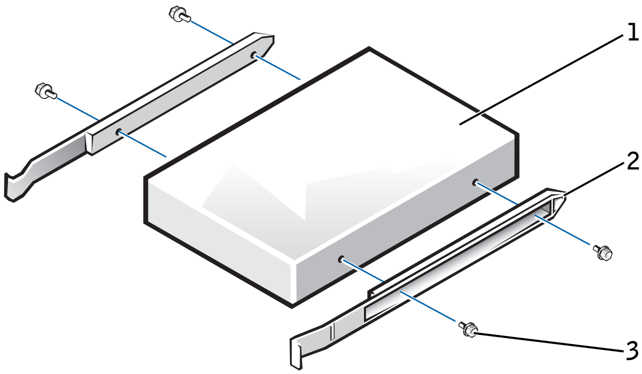
2 Press inward on the two tabs on the sides of the drive, slide the drive upward, and remove it from the floppy-drive bay.



1	tabs (2)
2	floppy drive

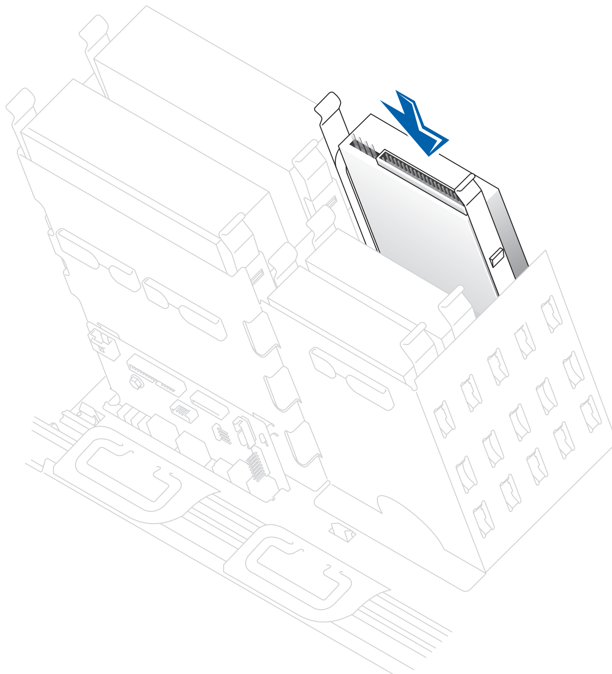
Installing a Floppy Drive

1 If you are replacing a drive and the the new drive does not have the bracket rails attached, remove the rails from the old drive by removing the two screws that secure each rail to the drive. Attach the bracket to the new drive by aligning the screw holes on the drive with the screw holes on the bracket rails and then inserting and tightening all four screws (two screws on each rail).

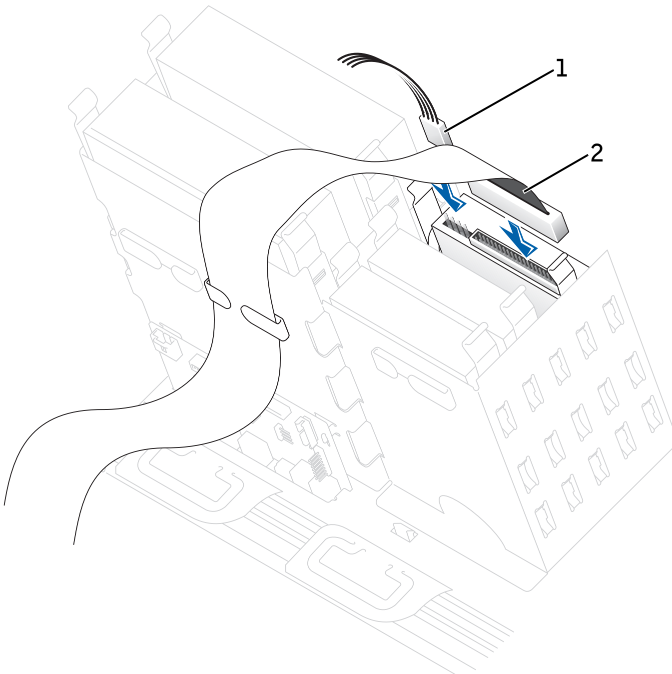


1	drive
2	bracket rails (2)
3	screws (4)

2 Gently slide the drive into place until the tabs securely click into position.



3 Attach the power and floppy-drive cables to the floppy drive.



1	power cable
2	floppy-drive cable

4 If you are installing a new floppy drive rather than replacing a drive, remove the front-panel inserts.

From inside the drive bay, gently press on each side of the insert until it pops out.

5 Check all cable connections, and fold cables out of the way to provide airflow for the fan and cooling vents.

6 Close the computer cover.

NOTICE: To connect a network cable, first plug the cable into the network wall jack and then plug it into the computer.

7 Connect your computer and devices to electrical outlets, and turn them on.

See the documentation that came with the drive for instructions on installing any software required for drive operation.

8 Enter system setup and update the appropriate **Diskette Drive A** option to reflect the size and capacity of your new floppy drive.

9 To verify that your computer works correctly, run the Dell Diagnostics.

CD/DVD Drive

CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *System Information Guide*.

1 Shut down the computer through the **Start** menu.

2 Ensure that your computer and attached devices are turned off. If your computer and attached devices did not automatically turn off when you shut down your computer, turn them off now.

NOTICE: To disconnect a network cable, first unplug the cable from your computer and then unplug it from the network wall jack.

3 Disconnect any telephone or telecommunication lines from the computer.

4 Disconnect your computer and all attached devices from electrical outlets, and then press the power button to ground the system board.

5 If you have installed a padlock through the padlock ring on the back panel, remove the padlock.

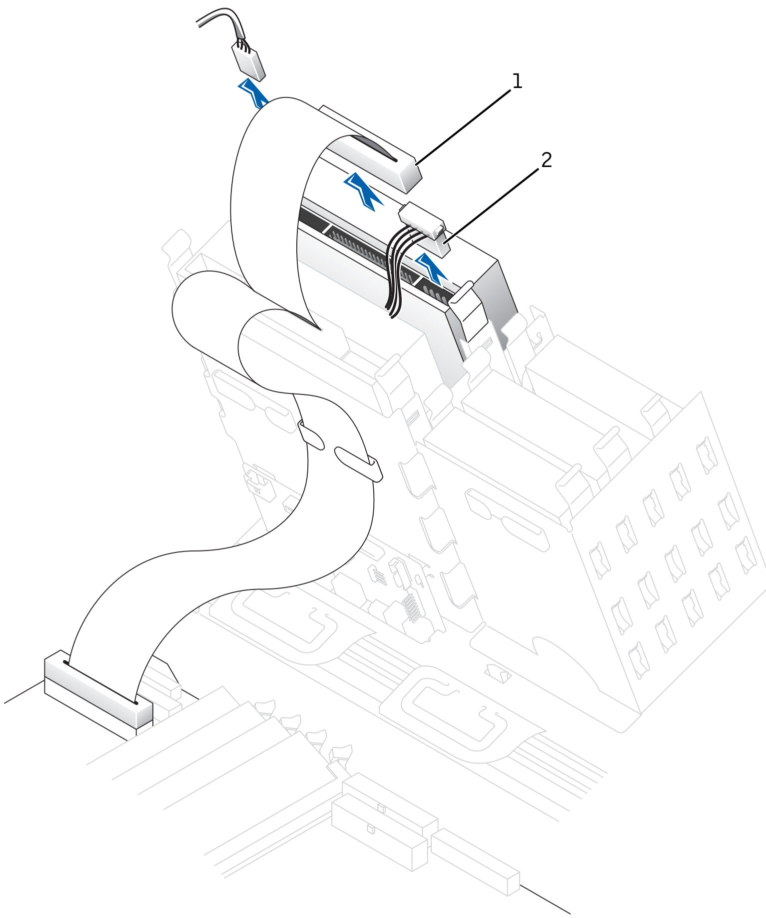
CAUTION: To guard against electrical shock, always unplug your computer from the electrical outlet before opening the cover.

NOTICE: Before touching anything inside your computer, ground yourself by touching an unpainted metal surface, such as the metal at the back of the computer. While you work, periodically touch an unpainted metal surface to dissipate any static electricity that could harm internal components.

6 Open the computer cover.

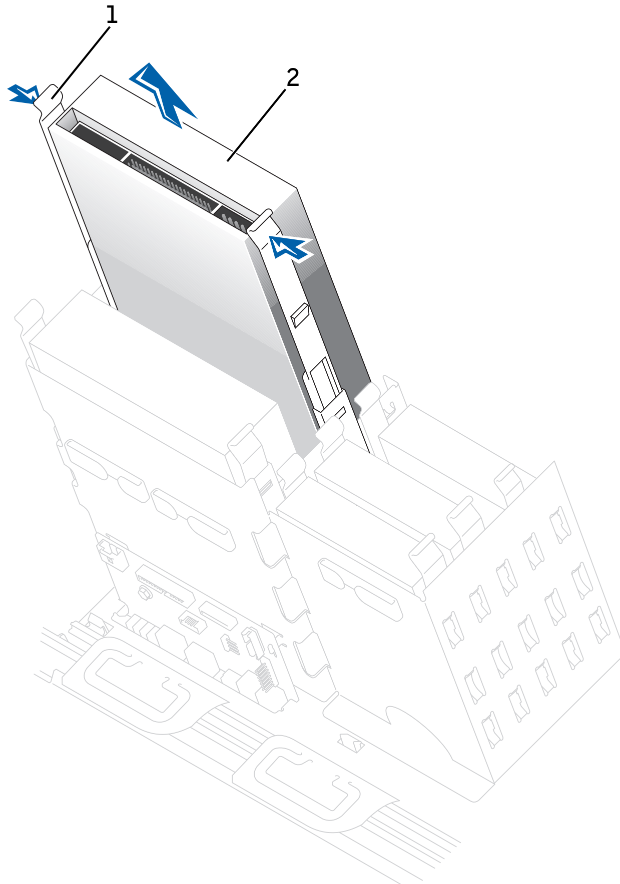
Removing a CD/DVD Drive

1 Disconnect the power and CD/DVD drive cables from the back of the drive.



1	CD/DVD drive cable
2	power cable

2 Press inward on the two tabs on the sides of the drive, and then slide the drive upward and remove it from the drive bay.



1	tabs (2)
2	CD/DVD drive

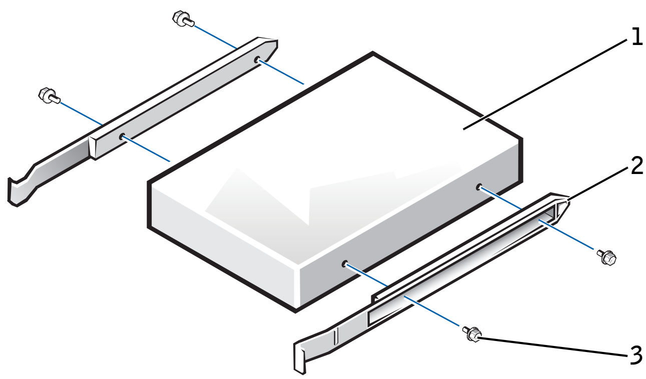
Installing a CD/DVD Drive

1 If you are installing a new drive, unpack the drive and prepare it for installation.

Check the documentation that accompanied the drive to verify that the drive is configured for your computer. If you are installing an IDE drive, configure the drive for the cable select setting.

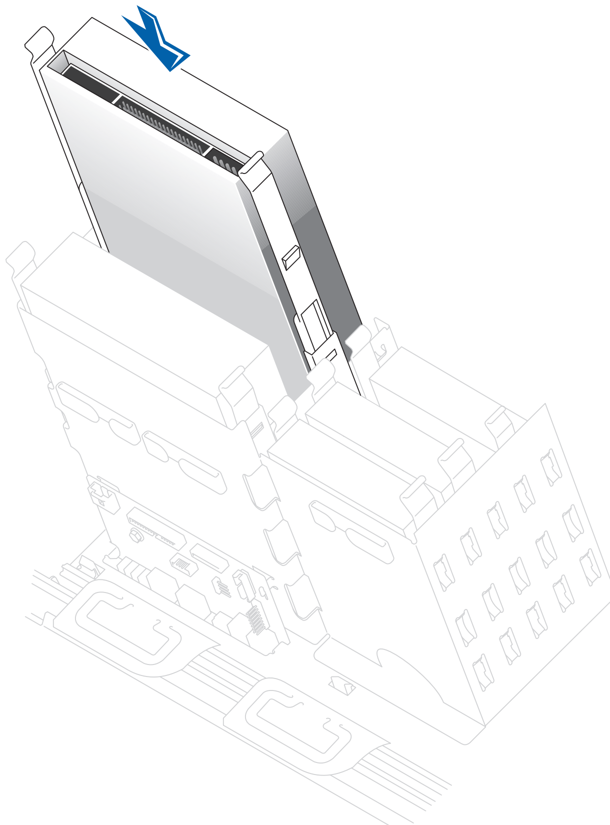
2 Connect the new drive to the set of rails that are attached to the inside of the computer cover. If a set of rails is not attached inside the cover, see Contacting Dell for the number to call for assistance.

3 If you are installing a replacement drive and the new drive does not have the bracket rails attached, remove the rails from the old drive by removing the two screws that secure each rail to the drive. Attach the bracket to the new drive by aligning the screw holes on the drive with the screw holes on the bracket rails and then inserting and tightening all four screws (two screws on each rail).



1	drive
2	bracket rails (2)
3	screws (4)

4 Gently slide the drive into place until the tabs securely click into position.

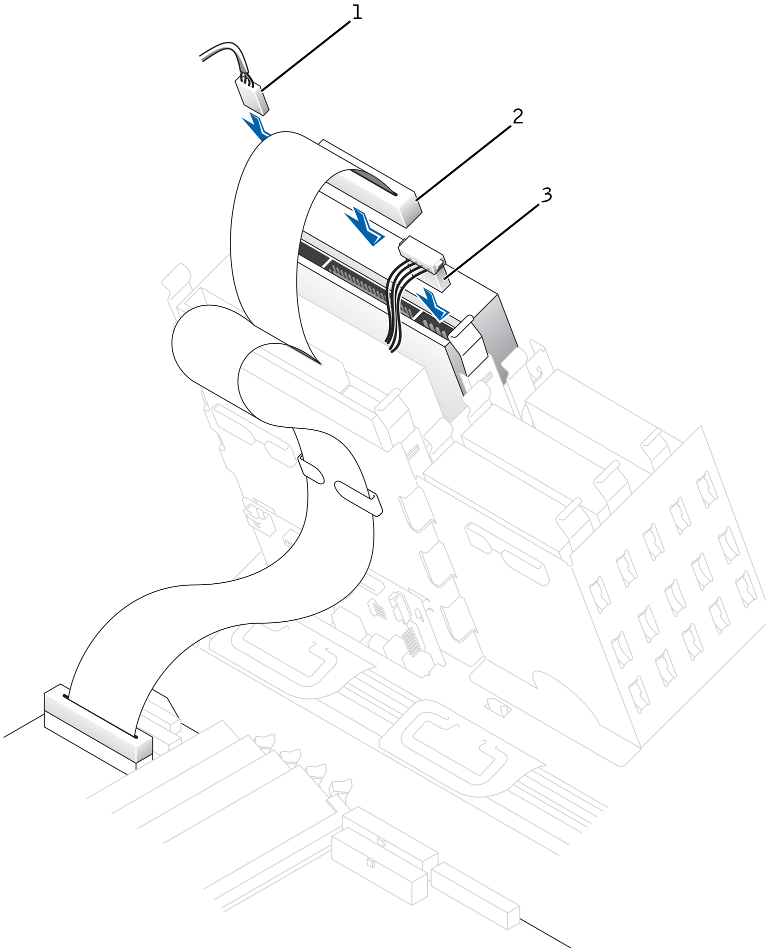


5 If you are installing a drive that has its own controller card, install the controller card in an expansion slot.

See the documentation that accompanied the drive and controller card to verify that the configuration is correct for your computer.

6 Connect the power and CD/DVD drive cables to the drive.

If you are adding a drive that has an audio cable, connect the audio cable to the audio connector on the system board.



1	audio cable (some drives do not have this cable)
2	CD/DVD drive cable
3	power cable

7 If you are installing a new CD/DVD drive rather than replacing a drive, remove the front-panel inserts.

From inside the drive bay, gently press on each side of the insert until it pops out.

8 Check all cable connections, and fold cables out of the way to provide airflow for the fan and cooling vents.

9 Close the computer cover.

NOTICE: To connect a network cable, first plug the cable into the network wall jack and then plug it into the computer.

10 Connect your computer and devices to electrical outlets, and turn them on.

See the documentation that came with the drive for instructions on installing any software required for drive operation.

11 Update your configuration information by setting the appropriate **Drive** option (**0** or **1**) under **Drives**: **Secondary** to **Auto**. See "Primary Drive n and Secondary Drive n" for more information.

12 To verify that your computer works correctly, run the Dell Diagnostics

13

SECTION 14

Microprocessor Airflow Shroud

CAUTION: Before you perform this procedure, follow the safety instructions in the *System Information Guide*.

1 Shut down the computer through the **Start** menu.

2 Ensure that your computer and attached devices are turned off. If your computer and attached devices did not automatically turn off when you shut down your computer, turn them off now.

NOTICE: To disconnect a network cable, first unplug the cable from your computer and then unplug it from the network wall jack.

3 Disconnect any telephone or telecommunication lines from the computer.

4 Disconnect your computer and all attached devices from electrical outlets, and then press the power button to ground the system board.

5 If you have installed a padlock through the padlock ring on the back panel, remove the padlock.

CAUTION: To guard against electrical shock, always unplug your computer from the electrical outlet before opening the cover.

NOTICE: Before touching anything inside your computer, ground yourself by touching an unpainted metal surface, such as the metal at the back of the computer. While you work, periodically touch an unpainted metal surface to dissipate any static electricity that could harm internal components.

6 Open the computer cover.

Removing the Microprocessor Airflow Shroud

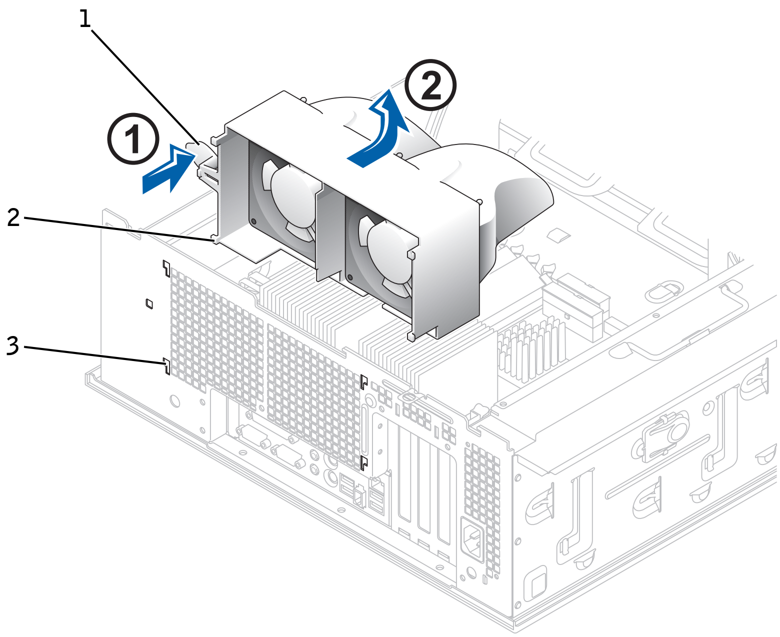
CAUTION: Before you perform this procedure, follow the safety instructions in the *System Information Guide*.

NOTICE: To avoid damaging the fan power cables, do not slide the shroud too quickly.

1 Press the shroud release lever towards the front of the computer.

2 Lift the shroud up to disengage the anchors.

3 Once the shroud has been disengaged from the anchors, unplug the fan cables from their connectors on the system board.



1	shroud release lever
2	anchor tabs
3	anchor slots

Installing the Microprocessor Airflow Shroud

1 Attach both fan power cables to the connectors on the system board.

2 Align the anchor tabs with the securing slots.

3 Gently press the shroud until the anchor tabs snap securely into place.

4 Close the computer cover.

NOTICE: To connect a network cable, first plug the cable into the network wall jack and then plug it into the computer.

5 Connect your computer and devices to electrical outlets, and turn them on.

14

SECTION 15

Microprocessor

Installation Guidelines

- Your computer is designed for dual-processor operations. The heat sinks (CPU_0 and CPU_1) are keyed to fit their specific connector.
- For single-processor operations, the processor must be installed in socket CPU_0. The VRM for the single processor is already installed and cannot be removed. Processor socket 1 and VRM connector 1 must be empty. To locate these components, see the system board components illustration (for the Dell Precision 450 computer, see "System Board Components" or for the Dell Precision 650 computer, see "System Board Components") or the system board label inside your computer.
- For dual-processor operations, both processor sockets and the VRM connector must be populated. To locate the VRM connector, see the system board components illustration (for the Dell Precision 450 computer, see "System Board Components" or for the Dell Precision 650 computer, see "System Board Components")or the system board label inside your computer.
- For dual-processor operations, the two processors and the VRMs must be identical. If the processors do not match, you receive a system message. If the processors voltage don't match or the VRM is not properly installed, the diagnostic lights indicate an error..
- If you are upgrading your microprocessor, keep your original microprocessor heat sink and securing clips for future troubleshooting.

Installing the Microprocessor

CAUTION: The processor can get very hot during normal operation. Ensure that the processor has had sufficient time to cool before you touch it.

CAUTION: Before you perform this procedure, follow the safety instructions in the *System Information Guide*.

1. Shut down the computer through the **Start** menu.
2. Ensure that your computer and attached devices are turned off. If your computer and attached devices did not automatically turn off when you shut down your computer, turn them off now.

NOTICE: To disconnect a network cable, first unplug the cable from your computer and then unplug it from the network wall jack.

3. Disconnect any telephone or telecommunication lines from the computer.
4. Disconnect your computer and all attached devices from electrical outlets, and then press the power button to ground the system board.

5 If you have installed a padlock through the padlock ring on the back panel, remove the padlock.

CAUTION: To guard against electrical shock, always unplug your computer from the electrical outlet before opening the cover.

NOTICE: Before touching anything inside your computer, ground yourself by touching an unpainted metal surface, such as the metal at the back of the computer. While you work, periodically touch an unpainted metal surface to dissipate any static electricity that could harm internal components.

6 Open the computer cover.

7 Remove the microprocessor airflow shroud (for the Dell Precision 650 computer, see "Microprocessor Airflow Shroud" or for the Dell Precision 450 computer, see "Microprocessor Airflow Shroud").

If you are replacing a microprocessor, see "Removing the Microprocessor."

NOTICE: You must position the microprocessor correctly in the socket to avoid permanent damage to the microprocessor and the computer.

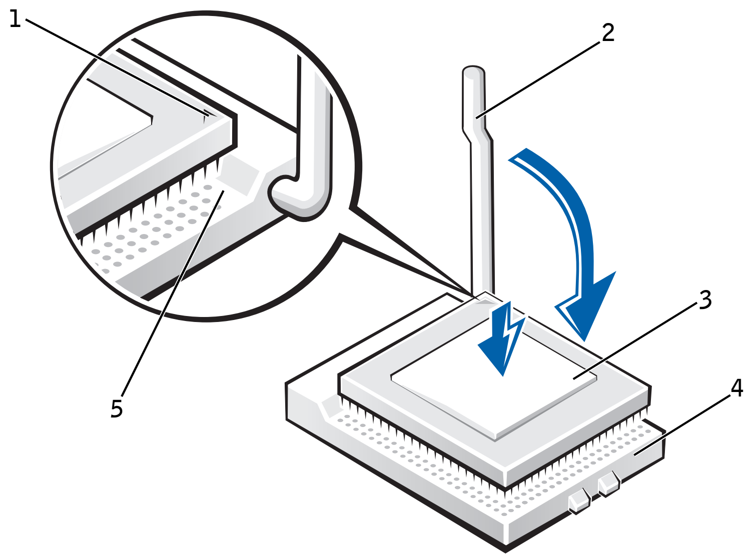
8 If the release lever is not extended to the release position, move it to that position.

9 Align pin-1 (the imprinted corner) of the microprocessor and pin-1 of the socket.

NOTICE: Microprocessor pins are delicate. To avoid damage, ensure that the microprocessor aligns properly with the socket, and do not use excessive force when you install the processor.

10 Carefully set the microprocessor in the socket and press it down lightly to seat it.

11 Rotate the release lever back toward the system board until it snaps into place, securing the microprocessor.



1	microprocessor pin-1 indicator
2	release lever
3	microprocessor
4	microprocessor socket
5	socket pin-1 indicator

12 Remove the thermal grease protective cover and place the heat sink in the base.

13 Place one end of the heat sink under the tab on the retention module on the side opposite the lever. Lower the heat sink onto the microprocessor so that the heat sink fits securely under the tab on the other end of the retention module.

14 Replace the retention module clips.

15 If you installed a microprocessor replacement kit from Dell, return the original heat sink assembly and microprocessor to Dell in the same package in which your replacement kit was sent.

16 If you are installing a second microprocessor, install the VRM.

17 Replace the airflow shroud (for the Dell Precision 650 computer, see "Microprocessor Airflow Shroud" or for the Dell Precision 450 computer, see "Microprocessor Airflow Shroud").

18 Close the computer cover.

NOTICE: To connect a network cable, first plug the cable into the network wall jack and then plug it into the computer.

19 Connect your computer and devices to electrical outlets, and turn them on.

Removing the Microprocessor

NOTE: It is recommended that only a technically knowledgeable person perform this procedure.

CAUTION: The processor can get very hot during normal operation. Ensure that the processor has had sufficient time to cool before you touch it.

CAUTION: Before you perform this procedure, follow the safety instructions in the *System Information Guide*.

1 Shut down the computer through the **Start** menu.

2 Ensure that your computer and attached devices are turned off. If your computer and attached devices did not automatically turn off when you shut down your computer, turn them off now.

NOTICE: To disconnect a network cable, first unplug the cable from your computer and then unplug it from the network wall jack.

3 Disconnect any telephone or telecommunication lines from the computer.

4 Disconnect your computer and all attached devices from electrical outlets, and then press the power button to ground the system board.

5 If you have installed a padlock through the padlock ring on the back panel, remove the padlock.

CAUTION: To guard against electrical shock, always unplug your computer from the electrical outlet before opening the cover.

NOTICE: Before touching anything inside your computer, ground yourself by touching an unpainted metal surface, such as the metal at the back of the computer. While you work, periodically touch an unpainted metal surface to dissipate any static electricity that could harm internal components.

6 Open the computer cover.

7 Remove the microprocessor airflow shroud (for the Dell Precision 650 computer, see "Microprocessor Airflow Shroud" or for the Dell Precision 450 computer, see "Microprocessor Airflow Shroud").

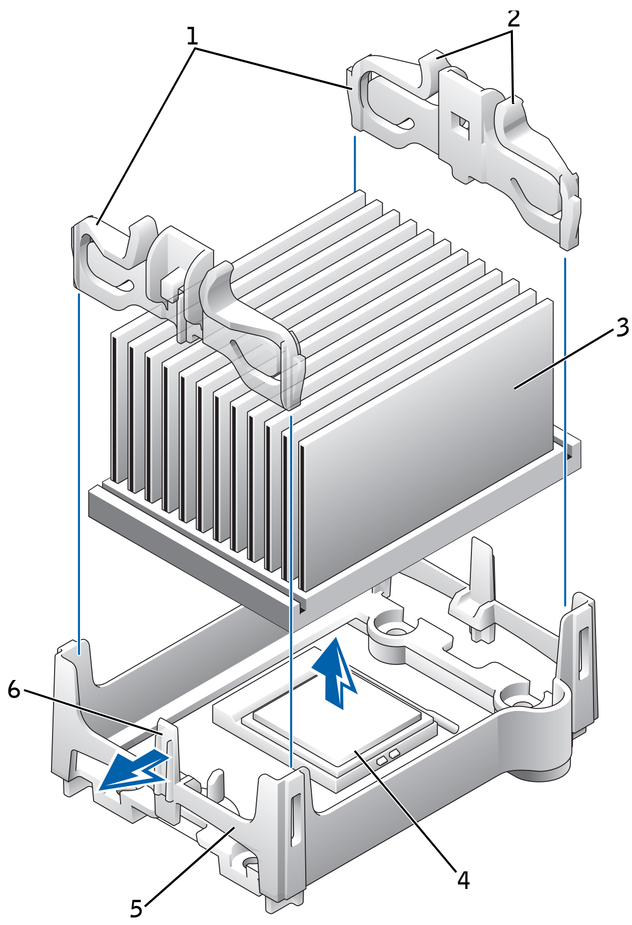
NOTICE: If you are installing a microprocessor upgrade kit from Dell, discard the original heat sink. If you are *not* installing a microprocessor upgrade kit from Dell, reuse the original heat sink when you install your new microprocessor.

8 Remove the microprocessor heat sink:

a Remove the two retention module clips by pressing the tabs together and lifting the retention module clips up.

b Press the lever on the retention module until the heat sink is released.

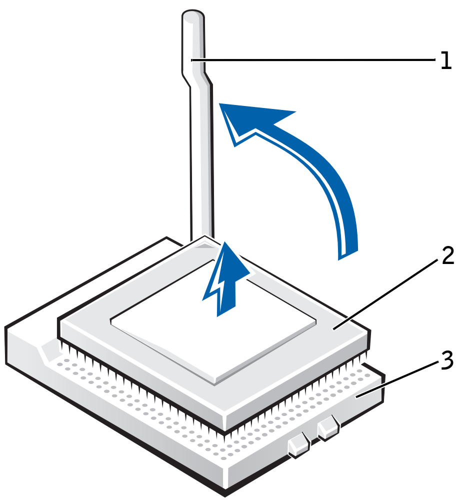
c Gently lift the heat sink from the microprocessor.



1	retention module clips (2)
2	tabs (2 on each retention module clip)
3	heat sink
4	microprocessor socket
5	retention module
6	lever

9 Pull the release lever straight up until the microprocessor is released.

NOTICE: Be careful not to bend any of the pins when you remove the microprocessor from the socket. Bending the pins can permanently damage the microprocessor.



1	release lever
2	microprocessor
3	socket

10 Remove the microprocessor from the socket.

If you are replacing the microprocessor, leave the release lever extended in the release position so that the socket is ready for the new microprocessor and go to "Installing the Microprocessor."

If you are removing a second microprocessor and not installing another one, remove the VRM and then continue with step 9.

11 Replace the airflow shroud (for the Dell Precision 650 computer, see "Microprocessor Airflow Shroud" or for the Dell Precision 450 computer, see "Microprocessor Airflow Shroud").

12 Close the computer cover.

NOTICE: To connect a network cable, first plug the cable into the network wall jack and then plug it into the computer.

13 Connect your computer and devices to electrical outlets, and turn them on.

VRM

NOTICE: A VRM must be installed to operate dual microprocessors. To locate the VRM connector, see the system board components illustration (for the Dell Precision 450 computer, see "System Board Components" or for the Dell Precision 650 computer, see "System Board Components") or the system board label inside your computer.

1 Shut down the computer through the **Start** menu.

2 Ensure that your computer and attached devices are turned off. If your computer and attached devices did not automatically turn off when you shut down your computer, turn them off now.

NOTICE: To disconnect a network cable, first unplug the cable from your computer and then unplug it from the network wall jack.

3 Disconnect any telephone or telecommunication lines from the computer.

4 Disconnect your computer and all attached devices from electrical outlets, and then press the power button to ground the system board.

5 If you have installed a padlock through the padlock ring on the back panel, remove the padlock.

CAUTION: To guard against electrical shock, always unplug your computer from the electrical outlet before opening the cover.

NOTICE: Before touching anything inside your computer, ground yourself by touching an unpainted metal surface, such as the metal at the back of the computer. While you work, periodically touch an unpainted metal surface to dissipate any static electricity that could harm internal components.

6 Open the computer cover.

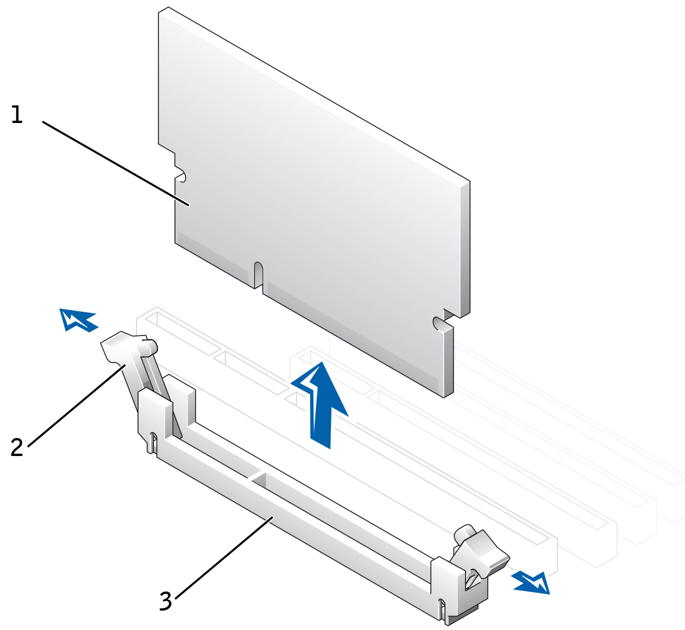
Installing a VRM

CAUTION: Before you perform this procedure, follow the safety instructions in the *System Information Guide*.

1 Remove the microprocessor airflow shroud (for the Dell Precision 650 computer, see "Microprocessor Airflow Shroud" or for the Dell Precision 450 computer, see "").

2 Press the securing clips at each end of the VRM connector outward until they snap open.

To locate the VRM connector, see the system board components illustration (for the Dell Precision 450 computer, see "System Board Components" or for the Dell Precision 650 computer, see "System Board Components") or see the system board label inside your computer.



1	VRM
2	securing clips (2)
3	connector

3 Align the notch on the bottom of the VRM with the ridges inside the connector.

4 Press the VRM straight down into the connector until the securing clips snap into place at the ends of the module.

5 Install the microprocessor airflow shroud (for the Dell Precision 650 computer, see "Microprocessor Airflow Shroud" or for the Dell Precision 450 computer, see "").

6 Close the computer cover.

NOTICE: To connect a network cable, first plug the cable into the network wall jack and then plug it into the computer.

7 Connect your computer and devices to electrical outlets, and turn them on.

Removing a VRM

CAUTION: Before you perform this procedure, follow the safety instructions in the *System Information Guide*.

1. Remove the microprocessor airflow shroud (for the Dell Precision 650 computer, see "Microprocessor Airflow Shroud" or for the Dell Precision 450 computer, see "").
2. Press the securing clips at each end of the connector outward simultaneously until the VRM slightly pops out from the connector.
3. Grasp the VRM by its top corners, and ease it out of the connector.
4. If you are installing a new VRM, see "Installing a VRM."

   If you are not installing a new VRM, continue with step 5.
5. Install the microprocessor airflow shroud (for the Dell Precision 650 computer, see "Microprocessor Airflow Shroud" or for the Dell Precision 450 computer, see "").
6. Close the computer cover.

NOTICE: To connect a network cable, first plug the cable into the network wall jack and then plug it into the computer.

7. Connect your computer and devices to electrical outlets, and turn them on.

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SECTION 17

Battery

CAUTION: Before you begin this procedure, follow the safety instructions in the *System Information Guide*.

A coin-cell battery maintains computer configuration, date, and time information. The battery can last several years.

The battery may need replacing if you have repeatedly reset the time and date information after turning on the computer or if one of the following messages appears:

```
Time-of-day not set - please run SETUP program
```

or

```
Invalid configuration information -
please run SETUP program
```

or

```
Strike the F1 key to continue,
F2 to run the setup utility
```

To determine whether you need to replace the battery, reenter the time and date in system setup and exit the program to save the information. Turn off your computer and disconnect it from the electrical outlet for a few hours; then reconnect the computer, turn it on, and enter system setup. If the date and time are not correct in system setup, replace the battery.

You can operate your computer without a battery; however, without a battery, the configuration information is erased if the computer is turned off or unplugged from the electrical outlet. In this case, you must enter system setup and reset the configuration options.

CAUTION: A new battery can explode if it is incorrectly installed. Replace the battery only with the same or equivalent type recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions.

NOTE: If you have not already done so, make a copy of your configuration information, found in system setup.

To replace the battery:

1. Shut down the computer through the **Start** menu.
2. Ensure that your computer and attached devices are turned off. If your computer and attached devices did not automatically turn off when you shut down your computer, turn them off now.

NOTICE: To disconnect a network cable, first unplug the cable from your computer and then unplug it from the network wall jack.

3 Disconnect any telephone or telecommunication lines from the computer.

4 Disconnect your computer and all attached devices from electrical outlets, and then press the power button to ground the system board.

5 If you have installed a padlock through the padlock ring on the back panel, remove the padlock.

CAUTION: To guard against electrical shock, always unplug your computer from the electrical outlet before opening the cover.

NOTICE: Before touching anything inside your computer, ground yourself by touching an unpainted metal surface, such as the metal at the back of the computer. While you work, periodically touch an unpainted metal surface to dissipate any static electricity that could harm internal components.

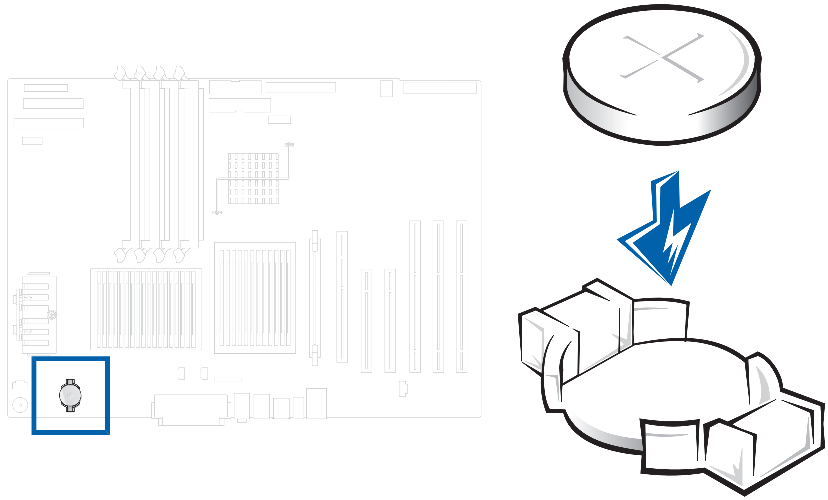
6 Open the computer cover.

7 Locate the battery socket. For the Dell Precision 450 computer, see "System Board Components" or for the Dell Precision 650 computer, see "System Board Components" or see the system board label inside your computer..

NOTICE: If you pry the battery out of its socket with a blunt object, be careful not to touch the system board with the object. Ensure that the object is inserted between the battery and the socket before you attempt to pry out the battery. Otherwise, you may damage the system board by prying off the socket or by breaking circuit traces on the system board.

8 Remove the battery by carefully prying it out of its socket with your fingers or with a blunt, nonconducting object such as a plastic screwdriver.

9 Insert the new battery into the socket with the side labeled "+" facing up, and snap the battery into place.



NOTICE: To connect a network cable, first plug the cable into the network wall jack and then plug it into the computer.

10 Close the computer cover, and plug your computer and devices into electrical outlets.

11 Enter system setup and restore the settings you recorded in step 1.

12 Properly dispose of the old battery. For more information see your *System Information Guide*.

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SECTION 18

Closing the Computer Cover

1 Ensure that all cables are connected, and fold cables out of the way.

2 Ensure that no tools or extra parts are left inside the computer.

3 Close the computer cover:

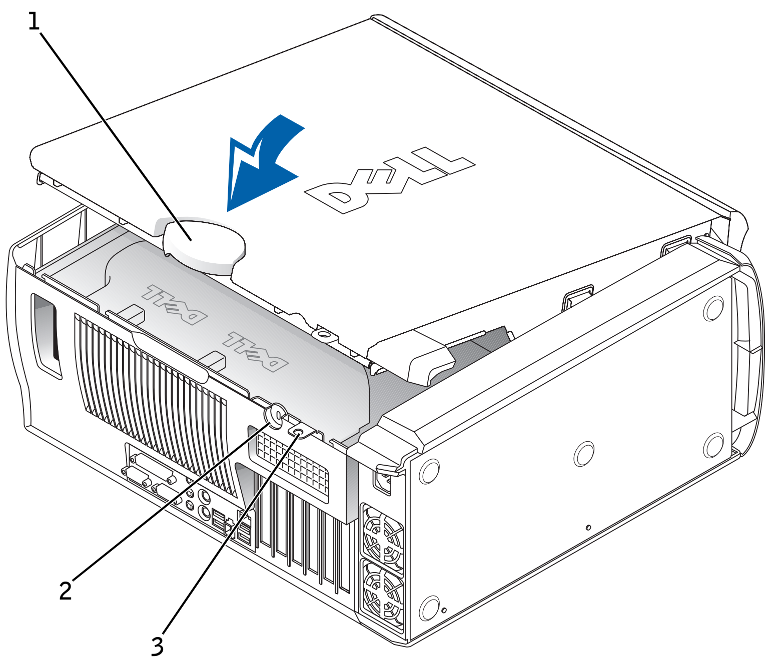
   a Pivot the cover down and into position.

   b If your computer has a baffle, ensure that the baffle is correctly positioned by guiding it into place as you lower the cover.

   c Press down on the cover to close it.

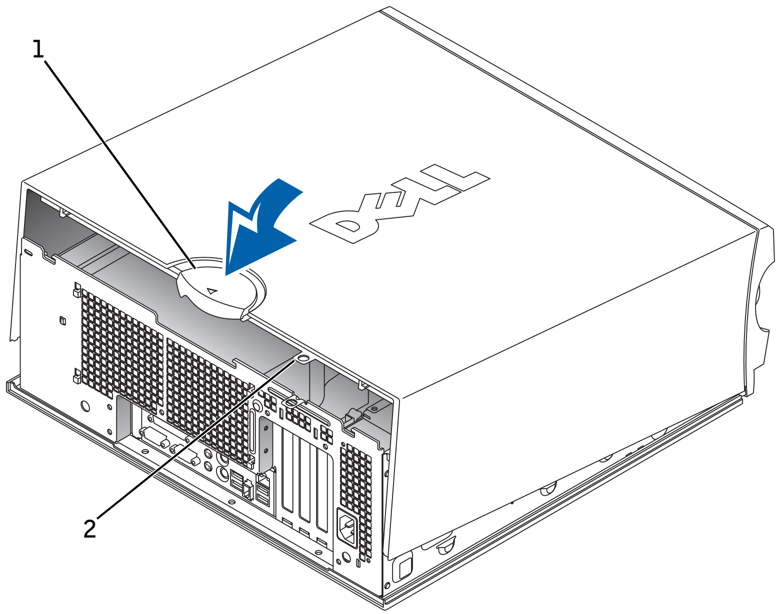
   d Once the cover is closed, slide the release latch to the right until the latch clicks into place.

Dell Precision 650



1	cover release latch
2	security cable slot
3	padlock ring

Dell Precision 450



1	cover release latch
2	padlock ring

4 If you are using a padlock to secure your computer, install the padlock.

NOTICE: To connect a network cable, first plug the cable into the network wall jack and then plug it into the computer.

5 Connect your computer and devices to electrical outlets, and turn them on.

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SECTION 19

Solving Problems

Video and Monitor Problems

Troubleshooting Your Computer

Follow these tips when troubleshooting your computer:

- If you added or removed a computer part before the problem started, review the installation procedures and ensure that the part is correctly installed.
- If a peripheral device does not work, ensure that the device is properly connected.
- If an error message appears on the screen, write down the exact message. This message may help technical support diagnose and fix the problem(s).
- If an error message occurs in a program, consult the program's documentation.

Battery Problems

Fill out the Diagnostics Checklist as you complete these checks.

CAUTION: There is a danger of a new battery exploding if it is incorrectly installed. Replace the battery only with the same or equivalent type recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions.

CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *System Information Guide*.

REPLACE THE BATTERY — If you have to repeatedly reset time and date information after turning on the computer, or if an incorrect time or date displays during start-up, replace the battery. If the battery still does not work properly, see "Contacting Dell" for the number to call.

Card Problems

Fill out the Diagnostics Checklist as you complete these checks.

CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *System Information Guide*.

CHECK THE CARD SEATING AND CABLE —

1. Turn off the computer and devices, disconnect them from electrical outlets, wait 10 to 20 seconds, and then open the computer cover.
2. Ensure that each card is firmly seated in its connector. Reseat any loose cards.
3. Ensure that all cables are firmly connected to their corresponding connectors on the cards. If any cables appear loose, reconnect them.

   For instructions on which cables should be attached to specific connectors on a card, see the card's documentation.
4. Close the computer cover, reconnect the computer and devices to electrical outlets, and then turn them on.

TEST THE VIDEO CARD —

1. Turn off the computer and devices, disconnect them from electrical outlets, wait 10 to 20 seconds, and then open the computer cover.
2. Remove all cards except the video card.

   If your primary hard drive is connected to a drive controller card and not to one of the system board IDE connectors, leave the drive controller card installed in the computer.
3. Close the computer cover, reconnect the computer and devices to electrical outlets, and turn them on.
4. Run the Dell Diagnostics.

   If any of the tests fail, see"Contacting Dell" for the number to call for assistance

TEST THE CARDS —

1. Turn off the computer and devices, disconnect them from electrical outlets, wait 10 to 20 seconds, and then open the computer cover.
2. Reinstall one of the cards that you removed previously.
3. Close the computer cover, reconnect the computer and devices to electrical outlets, and turn them on.
4. Run the Dell Diagnostics.

   If any of the diagnostics tests fail, the card you just reinstalled is faulty and needs to be replaced.
5. Repeat this process until you have reinstalled all cards.

   If you have reinstalled all of the cards and the problem is not resolved, see "Contacting Dell".

Drive Problems

Fill out the Diagnostics Checklist as you complete these checks.

Floppy drive problems

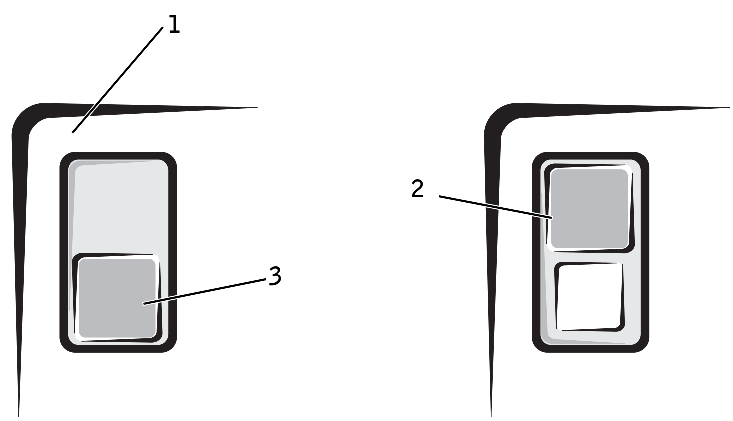
Ensure that Windows® recognizes the drive — Click the **Start** button and click **My Computer**. If the floppy drive is not listed, perform a full scan with your antivirus software to check for and remove viruses. Viruses can sometimes prevent Windows from recognizing the drive.

Test the drive —

- Insert another disk to eliminate the possibility that the original floppy disk is defective.
- Insert a bootable floppy disk and restart the computer.

Ensure that the disk is not full or write-protected —

Ensure that the disk has available space and that it is not write-protected (locked). See the following illustration.



1	back of floppy disk
2	write-protected
3	not write-protected

TEST THE FLOPPY DRIVE LIGHT —

MS-DOS®

Insert a floppy disk, type `dir a:` at the DOS prompt, and press <Enter>.

Microsoft Windows operating systems

Insert a floppy disk, click the **Start** button, click **My Computer,** and then double-click the floppy drive icon.

RUN THE Dell Diagnostics — If any of the tests fail, see "Contacting Dell" for the number to call.

NOTICE: Do not attempt to clean drive heads with a swab. You may accidentally misalign the heads, which can render the drive inoperable.

CLEAN THE DRIVE — Use a commercially available cleaning kit.

CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *System Information Guide*.

REMOVE AND REINSTALL THE FLOPPY DRIVE — For the Dell Precision™ 650 computer, see "Removing a Floppy Drive" or for the Dell Precision 450 computer, see "Removing a Floppy Drive" for information on performing this procedure.

If the computer displays a drive error message, see "Error Messages" for an explanation.

CD drive problems

NOTE: High-speed CD drive vibration is normal and may cause noise. This does not indicate a defect in the drive or the CD.

Adjust the Windows volume control — Click the speaker icon in the lower-right corner of your screen.

- Ensure that the volume is turned up by clicking the slidebar and dragging it up.
- Ensure that the sound is not muted by clicking any boxes that are checked.

Test the drive with another CD — Insert another CD to eliminate the possibility that the original CD is defective.

Check the speakers and subwoofer — See "Sound and Speaker Problems."

Ensure that Windows recognizes the drive — Click the **Start** button and click **My Computer**. If the CD drive is not listed, perform a full scan with your antivirus software to check for and remove viruses. Viruses can sometimes prevent Windows from recognizing the drive.

Clean the disc — Use a commercially available cleaning kit.

Problems writing to a CD-RW drive

Close other programs — The CD-RW drive must receive a steady stream of data when writing. If the stream is interrupted, an error occurs. Try closing all programs before writing to the CD-RW.

DVD drive problems

NOTE: Because of different worldwide file types, not all DVD titles work in all DVD drives.

Test the drive with another DVD — Insert another DVD to eliminate the possibility that the original DVD is defective.

Ensure that Windows recognizes the drive — Click the **Start** button and click **My Computer**. If the DVD drive is not listed, perform a full scan with your antivirus software to check for and remove viruses. Viruses can sometimes prevent Windows from recognizing the drive.

CLEAN THE DISC — Use a commercially available cleaning kit.

CHECK FOR INTERRUPT REQUEST CONFLICTS — See "Resolving Software and Hardware Incompatibilities."

Hard drive problems

RUN CHECK DISK —

For Windows XP

1. Click the **Start** button and click **My Computer**.
2. Right-click the drive letter (local disk) that you want to scan for errors, and then click **Properties**.
3. Click the **Tools** tab.
4. Under **Error-checking**, click **Check Now**.
5. Click **Start.**

For Windows 2000

1. Right-click **My Computer** on your desktop and click **Manage**.
2. Click **Storage** and click **Disk Management**.
3. Right-click the drive that you want to scan for errors and click **Properties**.
4. Select the **Tools** tabs and click **Check Now**.

   If the Tools tab isn't available or to further troubleshoot the drive, select the **Hardware** tab, click the drive you want to troubleshoot, and then click **Troubleshoot**.

RUN THE Dell Diagnostics — If the tests indicate a faulty drive or drive controller, see "Contacting Dell".

CHECK THE CABLE CONNECTIONS —

1 Ensure that the DC power cables from the power supply are firmly connected to the connectors on each drive.
2 Verify that the interface cable for each drive is firmly connected to the drive and to the system board.
3 Ensure that the control panel cable is firmly connected to the system board.

If the hard drive activity light does not blink during the boot routine, see "Contacting Dell".

If a drive error message displays, see "Error Messages" for an explanation.

If the primary hard drive that contains the operating system does not boot, files in the operating system might be corrupt. For more information, see your operating system documentation.

Dropped or Damaged Computer

CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *System Information Guide*..

CHECK THE CARD AND CABLE CONNECTIONS —

1 Turn off the computer and devices, disconnect them from electrical outlets, wait 10 to 20 seconds, and then open the computer cover.
2 Check all card connections in the computer, and reseat any loose cards.
3 Ensure that all cables are properly connected and that all components are properly seated in their connectors and sockets.
4 Close the computer cover, reconnect the computer and devices to electrical outlets, and turn them on.
5 Run the Dell Diagnostics.

   If any of the diagnostics tests fail, see "Contacting Dell" for the number to call for assistance

E-Mail, Modem, and Internet Problems

CHECK THE TELEPHONE LINE CONNECTION — Verify that the telephone line is connected to the jack on the modem. (The jack has either a green label or a connector-shaped icon next to it.) Ensure that you hear a click when you insert the telephone line connector into the modem.

CHECK THE TELEPHONE JACK — Disconnect the telephone line from the modem and connect it to a telephone. Listen for a dial tone.

CONNECT THE MODEM DIRECTLY TO THE TELEPHONE WALL JACK —

If you have other telephone devices sharing the line, such as an answering machine, fax machine, surge protector, or line splitter, then bypass them and use the telephone to connect the modem directly to the telephone wall jack.

USE A DIFFERENT TELEPHONE LINE — If you are using a line that is 3 m (10 ft) or more in length, try a shorter one.

RUN THE MODEM HELPER DIAGNOSTICS — Click the **Start** button, point to **All Programs**, and then click **Modem Helper**. Follow the instructions on the screen to identify and resolve modem problems. (Modem Helper is not available on all computers.)

VERIFY THAT THE MODEM IS COMMUNICATING WITH WINDOWS® —

1 Click the **Start** button, and then click **Control Panel**.
2 Click **Printers and Other Hardware**.
3 Click **Phone and Modem Options**.
4 Click the **Modems** tab.
5 Click the COM port for your modem.
6 Click **Properties**, click the **Diagnostics** tab, and then click **Query Modem** to verify that the modem is communicating with Windows.
   If all commands receive responses, the modem is operating properly.

TURN OFF CALL WAITING (CATCH-PHONE) — See your telephone directory for instructions on deactivating this feature. Then adjust the dial-up networking connection properties.

1 Click the **Start** button, and then click **Control Panel.**
2 Click **Printers and Other Hardware**, and then click **Phone and Modem Options.**
3 Click your connection type to highlight it.
4 Click the **Dialing Rules** tab, and then click **Edit**.
5 Click the **To Disable Call Waiting** box to place a checkmark in it.
6 Select the disable code from the drop-down menu (for example, *70).
7 Click **Apply**, and then click **OK**.

ENSURE THAT YOU ARE CONNECTED TO THE INTERNET — With the Outlook Express e-mail program open, click **File**. If **Work Offline** has a checkmark next to it, click the checkmark to remove it and connect to the Internet.

ENSURE THAT YOU HAVE SUBSCRIBED TO AN INTERNET SERVICE PROVIDER — Contact an Internet service provider to subscribe.

CONTACT YOUR INTERNET SERVICE PROVIDER — Contact your Internet service provider for assistance.

CHECK FOR INTERRUPT REQUEST CONFLICTS — See "Resolving Software and Hardware Incompatibilities."

Error Messages

If the message is not listed, see the documentation for the operating system or the program that was running when the message appeared.

A FILENAME CANNOT CONTAIN ANY OF THE FOLLOWING CHARACTERS: \ / : * ? " < > | — Do not use these characters in filenames.

A REQUIRED .DLL FILE WAS NOT FOUND — The program that you are trying to open is missing an essential file. To remove and then reinstall the program:

1 Click the **Start** button.
2 Click **Control Panel**.
3 Click **Add or Remove Programs**.
4 Select the program you want to remove.
5 Click the **Change or Remove Program** icon.
6 See the program documentation for installation instructions.

ALERT! CARD CAGE FAN FAILURE — The PCI card cooling fan is not installed, has failed, or is not properly connected to the system board. Ensure that an operational fan is properly installed and connected to the system board. For more information, see the *Service Manual* at **support.dell.com**.

NOTE: This error message applies only to Dell Precision™ 650 computers.

ALERT! CHIPSET HEATSINK NOT DETECTED — The heat sink is not properly installed on the system board. Reseat the heat sink on the system board. See the system board illustration for your computer (for the Dell Precision 650 computer, see "System Board Components" or for the Dell Precision 450 computer, see "System Board Components."

ALERT! COVER WAS PREVIOUSLY OPENED — The computer cover was opened. Enter system setup and reset the **Chassis Intrusion** option.

ALERT! CPU 0 FAN FAILURE — The cooling fan for microprocessor 0 is not installed, has failed, or is not properly connected to the system board. Ensure that the cooling fan is properly installed and working. Also, ensure that the microprocessor airflow shroud is properly installed. See "Microprocessor Airflow Shroud"

ALERT! CPU 1 FAN FAILURE — The cooling fan for microprocessor 1 is not installed, has failed, or is not properly connected to the system board. Ensure that the cooling fan is properly installed and working. Also, ensure that the microprocessor airflow shroud is properly installed. See "Microprocessor Airflow Shroud."

ALERT! MEMORY POPULATION MISMATCH. DIMM SLOT 1 AND DIMM SLOT 3 ARE DISABLED AND PERFORMANCE WILL BE DEGRADED — The memory module connectors are not populated in matched pairs or there is a defective memory module in the computer. Ensure that memory modules of identical size, type, speed, and number of chips are installed in memory module connectors 1 and 2 and memory modules of identical size, type, speed, and number of chips are installed in memory module connectors 3 and 4 (if used). See .

ALERT! OPERATING IN DEBUG MODE. PLEASE POPULATE MEMORY IN PAIRS FOR NORMAL OPERATION — This message appears when one memory module is installed in memory module connector 4. This is a troubleshooting mode that allows you to isolate a defective memory module, see "Memory Problems."

ALERT! OS INSTALL MODE ENABLED — The **OS Install Mode** in system setup is set to **On**, which limits the amount of memory to 256 MB because some operating systems will not complete installation with more than 2 GB of memory. After you have installed the operating system, enter system setup and set the **OS Install Mode** to **Off**.

ALERT! POWER SUPPLY FAN FAILURE — The power supply fan has failed or is blocked. Ensure that the power supply airflow vents are not blocked.

ALERT! PREVIOUS ATTEMPTS AT BOOTING THIS SYSTEM HAVE FAILED AT CHECKPOINT [*nnnn*]. FOR HELP IN RESOLVING THIS PROBLEM, PLEASE NOTE THIS CHECKPOINT AND CONTACT DELL TECHNICAL SUPPORT — The computer failed to complete the boot routine three consecutive times for the same error. see "Contacting Dell" and report the checkpoint code (*nnnn*) to the support technician.

ALERT! PREVIOUS FAN FAILURES — The fan caused an error last time you used the computer. Ensure that nothing is blocking the airflow vents and that all the fans are properly installed and operating correctly.

ALERT! PREVIOUS PROCESSOR THERMAL FAILURE — The microprocessor overheated the last time you used the computer. Ensure that nothing is blocking the airflow vents and that all the fans are properly installed and operating correctly. Also, ensure that the microprocessor heat sink is properly installed.

ALERT! PREVIOUS REBOOT WAS DUE TO VOLTAGE REGULATOR FAILURE — The VRM failed the last time you used the computer. See "Contacting Dell" for assistance.

ALERT! PREVIOUS SHUTDOWN DUE TO THERMAL EVENT — The microprocessor overheated the last time you used the computer. Ensure that nothing is blocking the airflow vents and that all the fans are working correctly. Also, ensure that the microprocessor heat sink is properly installed.

ALERT! PREVIOUS VOLTAGE FAILURE — Voltage used by the computer either exceeded or fell below acceptable thresholds. See "Power Problems" and "System Board Problems."

ALERT! PROCESSOR CACHE SIZE MISTMATCH. INSTALL LIKE PROCESSORS OR ONE PROCESSOR. SYSTEM HALTED! — Two processor with different cache sizes are installed. See "Microprocessor."

ALERT! PROCESSOR SPEED MISMATCH. INSTALL LIKE PROCESSORS OR ONE PROCESSOR. SYSTEM HALTED! — Two processor with different speeds are installed. See "Microprocessor."

ALERT! PROCESSOR TYPE MISMATCH. INSTALL LIKE PROCESSORS OR ONE PROCESSOR. SYSTEM HALTED! — Two processor with different types are installed. See "Microprocessor."

ALERT! SYSTEM BATTERY VOLTAGE IS LOW — The computer battery is providing inadequate voltage. See .

ALERT! UNSUPPORTED HIGH POWER AGP PRO VIDEO ADAPTER DETECTED. SYSTEM HALTED! — A high-power AGP Pro110 video adatper is installed. Replace the AGP Pro110 video adapter with an AGP Pro50 adapter. See Cards.

NOTE: This error message applies only to Dell Precision 450 computers.

ALERT! UNSUPPORTED PROCESSOR TYPE DETECTED. SYSTEM HALTED! — Replace the microprocessor. See "Microprocessor."

ALERT! UNCORRECTABLE MEMORY ERROR PREVIOUSLY DETECTED... ADDRESS *XXXXXXXX*H — One or more memory modules may be improperly seated or faulty or the system board may be faulty. See "Memory Problems" and "System Board Problems."

ATTACHMENT FAILED TO RESPOND — The floppy or hard drive controller cannot send data to the associated drive. See "Floppy drive problems" or "Hard drive problems" for troubleshooting suggestions.

BAD COMMAND OR FILE NAME — Ensure that you have spelled the command correctly, have put spaces in the proper place, and have used the correct pathname.

BAD ERROR-CORRECTION CODE (ECC) ON DISK READ — The floppy or hard drive controller detected an uncorrectable read error. See "Floppy drive problems" or "Hard drive problems" for troubleshooting suggestions.

CONTROLLER HAS FAILED — The hard drive or the associated controller is defective. See "Floppy drive problems" or "Hard drive problems" for troubleshooting suggestions.

DATA ERROR — The floppy or hard drive cannot read the data.

- For the Microsoft® Windows® operating system, run the chkdsk utility to check the file structure of the floppy or hard drive.
- For another operating system, run the appropriate corresponding utility.

See your operating system documentation for information on running these utilities.

DECREASING AVAILABLE MEMORY — One or more memory modules might be faulty or improperly seated.

- Reinstall the memory modules and, if necessary, replace them.
- See "Memory Problems" for additional troubleshooting suggestions.

DISKETTE DRIVE 0 SEEK FAILURE — A cable might be loose or the computer configuration information may not match the hardware configuration. See "Floppy drive problems" for troubleshooting suggestions.

DISKETTE READ FAILURE — The floppy disk may be defective or a cable might be loose.

- If the drive access light turns on, try a different disk.
- See "Floppy drive problems" for troubleshooting suggestions.

DISKETTE SUBSYSTEM RESET FAILED — The floppy drive controller might be faulty. Run the Dell Diagnostics.

DISKETTE WRITE PROTECTED — The floppy disk is write-protected. Slide the write-protect notch to the open position.

DRIVE NOT READY — No floppy disk is in the drive. Put a floppy disk in the drive.

GATE A20 FAILURE — One or more memory modules might be faulty or improperly seated.

- Reinstall the memory modules and, if necessary, replace them.
- See "Memory Problems" for additional troubleshooting suggestions.

GENERAL FAILURE — The operating system is unable to carry out the command. This message is usually followed by specific information—for example, `Printer out of paper`. Take the appropriate action to resolve the problem.

HARD-DISK CONFIGURATION ERROR —
HARD-DISK CONTROLLER FAILURE —
HARD-DISK DRIVE FAILURE —
The hard drive failed initialization.

- Run the Dell Diagnostics.
- See "Hard drive problems" for troubleshooting suggestions.

INSERT BOOTABLE MEDIA — The operating system is trying to boot to a nonbootable floppy disk or CD. Insert a bootable floppy disk or CD.

INVALID CONFIGURATION INFORMATION - PLEASE RUN SETUP PROGRAM — The computer configuration information does not match the hardware configuration. Enter system setup and correct the computer configuration information.

KEYBOARD CONTROLLER FAILURE —
KEYBOARD STUCK KEY FAILURE —
KEYBOARD FAILURE —

A cable or connector might be loose, or the keyboard or keyboard/mouse controller might be faulty. See "Keyboard Problems."

MEMORY ADDRESS LINE FAILURE AT *address*, READ *value* EXPECTING *value* — A memory module might be faulty or improperly seated. Reinstall the memory modules and, if necessary, replace them. See "Memory Problems" for additional troubleshooting suggestions.

MEMORY ALLOCATION ERROR — The software you are attempting to run is conflicting with the operating system, another program, or a utility.

1. Turn off the computer, wait 30 seconds, and then restart the computer.
2. Try to run the program again.
3. If the error message appears again, see the software documentation for additional troubleshooting suggestions.

MEMORY DATA LINE FAILURE AT *address*, READ *value* EXPECTING *value* —
MEMORY DOUBLE WORD LOGIC FAILURE AT *address*, READ *value* EXPECTING *value* —
MEMORY ODD/EVEN LOGIC FAILURE AT *address*, READ *value* EXPECTING *value* —
MEMORY WRITE/READ FAILURE AT *address*, READ *value* EXPECTING *value* —

A memory module might be faulty or improperly seated. Reinstall the memory modules and, if necessary, replace them. See "Memory Problems" for additional troubleshooting suggestions.

MEMORY SIZE IN CMOS INVALID — The amount of memory recorded in the computer configuration information does not match the memory installed in the computer. Restart the computer. If the error message appears again, see "Contacting Dell". See "Memory Problems" for additional troubleshooting suggestions.

No boot device available — The computer cannot find the floppy disk or hard drive.

- If the floppy drive is your boot device, ensure that a bootable floppy disk is in the drive.
- If the hard drive is your boot device, ensure that the drive is installed, properly seated, and partitioned as a boot device.
- Enter system setup and ensure that the boot sequence information is correct.

No boot sector on hard-disk drive — •The computer configuration information in system setup might be incorrect. Enter system setup and ensure that the computer configuration information for the hard drive is correct.

- If the message continues to appear after you confirmed that the information in system setup is correct, the operating system might have been corrupted. Reinstall the operating system. See your operating system documentation for reinstallation information.

No timer tick interrupt — A chip on the system board might be malfunctioning. Run the Dell Diagnostics.

Non-system disk or disk error — The floppy disk in drive A or your hard drive does not have a bootable operating system installed on it. Either replace the floppy disk with one that has a bootable operating system, or remove the floppy disk from drive A and restart the computer.

Not a boot diskette — The operating system is trying to boot to a floppy disk that does not have a bootable operating system installed on it. Insert a bootable floppy disk.

Not enough memory or resources. Close some programs and try again — You have too many programs open. Close all windows and open the program that you want to use. In some cases, you might have to restart your computer to restore computer resources. If so, try running the program that you want to use first.

Operating system not found — see"Contacting Dell" for the number to call for assistance.

Plug and Play Configuration Error — The computer encountered a problem while trying to configure one or more cards.

1 Turn your computer off, unplug it from the electrical outlet, and remove all but one of the cards.
2 Plug in your computer and restart it.
3 If the message reappears, the installed card might be malfunctioning. If the message does not reappear, turn off the computer and reinsert one of the other cards.
4 Repeat this process until you identify which card is malfunctioning.

Read fault — The operating system cannot read from the floppy or hard drive, the computer could not find a particular sector on the disk, or the requested sector is defective. See "Floppy drive problems" or "Hard drive problems" for troubleshooting suggestions.

Requested sector not found — The operating system cannot read from the floppy or hard drive, the computer could not find a particular sector on the disk, or the requested sector is defective. See "Floppy drive problems" or "Hard drive problems" for troubleshooting suggestions.

Reset failed — The disk reset operation failed. See "Floppy drive problems" or "Hard drive problems" for troubleshooting suggestions.

Sector not found — The operating system cannot locate a sector on the floppy or hard drive.

- Run the Windows error-checking utility to check the file structure on the floppy disk or hard drive. See Windows Help for instructions (see Finding Information for Your Computer).
- If a large number of sectors are defective, back up the data (if possible), and then reformat the floppy disk or hard drive.

Seek error — The operating system cannot find a specific track on the floppy disk or hard drive. See "Floppy drive problems" or "Hard drive problems" for troubleshooting suggestions.

Shutdown failure — A chip on the system board might be malfunctioning. Run the Dell Diagnostics.

THE FILE BEING COPIED IS TOO LARGE FOR THE DESTINATION DRIVE — The file that you are trying to copy is too large to fit on the disk. Try copying the file to a blank disk or using a larger-capacity disk.

TIME-OF-DAY CLOCK STOPPED — The battery might be dead. Enter system setup and correct the date or time. If the problem persists, see "Contacting Dell". See "Battery Problems" for additional troubleshooting suggestions.

TIME-OF-DAY NOT SET — The time or date stored in system setup does not match the computer clock. Enter system setup and correct the **Date** and **Time** options.

TIMER CHIP COUNTER 2 FAILED — A chip on the system board might be malfunctioning. Run the Dell Diagnostics.

UNEXPECTED INTERRUPT IN PROTECTED MODE — The keyboard controller might be malfunctioning, or a memory module might be loose. Run the Dell Diagnostics.

WARNING: DELL'S DISK MONITORING SYSTEM HAS DETECTED THAT DRIVE [0/1] ON THE [PRIMARY/SECONDARY] EIDE CONTROLLER IS OPERATING OUTSIDE OF NORMAL SPECIFICATIONS. IT IS ADVISABLE TO IMMEDIATELY BACK UP YOUR DATA AND REPLACE YOUR HARD DRIVE BY CALLING YOUR SUPPORT DESK OR DELL — During initial start-up, the drive detected possible error conditions.

- When your computer finishes booting, immediately back up your data and replace your hard drive.
- If no replacement drive is immediately available and the drive is not the only bootable drive, enter system setup and change the appropriate drive setting to **None**. Then remove the drive from the computer.

WRITE FAULT — The operating system cannot write to the floppy or hard drive. See "Floppy drive problems" or "Hard drive problems" for troubleshooting suggestions.

WRITE FAULT ON SELECTED DRIVE — The operating system cannot write to the floppy or hard drive. See "Floppy drive problems" or "Hard drive problems" for troubleshooting suggestions.

x:\ IS NOT ACCESSIBLE. THE DEVICE IS NOT READY — The floppy drive cannot read the disk. Insert a floppy disk into the drive and try again.

General Problems

The computer stops responding

TURN THE COMPUTER OFF — If your computer locks up and you are unable to get a response by pressing a key on your keyboard or moving your mouse, press and hold the power button for at least 8 to 10 seconds until the computer turns off. Then press the power button again to turn on the computer. You might lose data if you are unable to perform an operating system shutdown.

If the computer locks up and the power button fails to function properly, unplug the power cable from the computer, wait for the computer to completely stop running, and plug in the power cable. If the computer does not restart, press the power button to restart the computer.

A program stops responding

END THE PROGRAM —

Windows® XP, Windows 2000

1 Press <Ctrl><Shift><Esc> simultaneously.

2 Click **Applications**.

3 Click the program that is no longer responding.

4 Click **End Task**.

A program crashes repeatedly

NOTE: Software usually includes installation instructions in its documentation or on a floppy disk or CD.

CHECK THE SOFTWARE DOCUMENTATION — Many software manufacturers maintain websites with information that may help you solve the problem. Ensure that you properly installed and configured the program. If necessary, uninstall and then reinstall the program.

A program is designed for an earlier Windows operating system

IF YOU ARE USING WINDOWS XP, RUN THE PROGRAM COMPATIBILITY WIZARD —

Windows XP provides a Program Compatibility Wizard that configures a program so it runs in an environment similar to non-Windows XP operating system environments.

1 Click the **Start** button, point to **All Programs**→ **Accessories**, and then click **Program Compatibility Wizard**.

2 In the welcome screen, click **Next**.

3 Follow the instructions on the screen.

A solid blue screen appears

TURN THE COMPUTER OFF — If the computer does not respond to a keystroke or a proper shutdown, press the power button for at least 8 to 10 seconds until the computer turns off. Press the power button again to restart the computer. The chkdsk program automatically runs during the start-up process. Follow the instructions on the screen.

Other software problems

CHECK THE SOFTWARE DOCUMENTATION OR CONTACT THE SOFTWARE MANUFACTURER FOR TROUBLESHOOTING INFORMATION

BACK UP YOUR FILES IMMEDIATELY — If your computer has a CD-RW drive or a zip drive installed, see the drive's documentation for instructions.

ENSURE THAT YOU HAVE NOT MADE AN ERROR WHILE ENTERING DATA — See the program documentation to make sure that the values or characters you are entering are valid.

CHECK FOR VIRUSES — Use a virus-scanning program to check the hard drive, floppy disks, or CDs.

RESTART THE COMPUTER — Save and close any open files, exit any open programs, and then shut down your computer through the **Start** menu instead of pressing the power button. Otherwise, you may lose data.

CHECK FOR COMPATIBILITY —

- Ensure that the program is compatible with the operating system installed on your computer and that your computer meets the minimum hardware requirements needed to run the software. See the software documentation for information.
- If necessary, uninstall and then reinstall the program.

ENSURE THAT YOU PROPERLY INSTALLED AND CONFIGURED THE PROGRAM — See the software documentation for information. If necessary, uninstall and then reinstall the program.

RUN THE Dell Diagnostics — If all tests run successfully, the error condition is related to a software problem.

CHECK FOR DEVICE DRIVER CONFLICTS —

- Verify that the program's device drivers do not conflict with certain programs.
- Call the software manufacturer for technical assistance.

Other technical problems

GO TO THE DELL SUPPORT WEBSITE — Go to **support.dell.com** for help with general usage, installation, and troubleshooting questions.The support website offers several different tools to help you such as Dell Forum — a chat room where you can communicate with other Dell customers about their computers and gain access to technical support through e-mail. See Finding Information for Your Computer for more about the Dell Support website.

CALL DELL — If you cannot solve your problem by using the Dell Support website, call Dell for technical assistance. See Technical Support Service for a description of the hardware and software support provided by Dell.

General hardware problems

If your computer exhibits one or more of the following symptoms, a device conflict may exist:

- Your computer locks up, particularly while using a specific device.
- A recently added device does not work.
- Memory parity errors occur on parity-enabled computers.
- A sound card emits noise or demonstrates other problems.
- Unintelligible characters print from the printer.
- The mouse pointer does not move or "stutters" when it moves.
- Messages appear stating that the computer is not operating at maximum performance.
- Errors occur and programs crash for no apparent reason.
- Nothing displays on the monitor.

REMOVE ANY RECENTLY ADDED HARDWARE TO SEE IF IT RESOLVES THE CONFLICT — If removing the hardware resolves the conflict, see the hardware documentation for configuration and troubleshooting instructions. If the problem persists, contact the hardware manufacturer for technical assistance.

CHECK YOUR OPERATING SYSTEM DOCUMENTATION FOR ADDITIONAL TROUBLESHOOTING INFORMATION

CHECK FOR INTERRUPT REQUEST CONFLICTS — See Resolving Software and Hardware Incompatibilities.

IEEE 1394 Device Problems

NOTE: Check Windows Explorer to see if your device is listed as a drive.

CHECK THE IEEE 1394 DEVICE — Ensure that the IEEE 1394 device is properly inserted into the connector.

ENSURE THAT THE IEEE 1394 DEVICE IS RECOGNIZED BY WINDOWS® —

1. Click the **Start** button.
2. Click **Control Panel**.
3. Click **Printers and Other Hardware**.

   If your IEEE 1394 device is listed, Windows recognizes the device.

IF YOU HAVE PROBLEMS WITH A DELL-PROVIDED IEEE 1394 DEVICE — see "Contacting Dell".

IF YOU HAVE PROBLEMS WITH A IEEE 1394 DEVICE NOT PROVIDED BY DELL — Contact the IEEE 1394 device manufacturer.

Keyboard Problems

Fill out the Diagnostics Checklist as you complete these checks.

RESTART THE COMPUTER —

- If the mouse is functioning, shut down the computer through the **Start** menu. After the computer shuts down, press the power button to restart the computer.
- If the computer does not respond to a keystroke or the mouse, press the power button for at least 8 to 10 seconds until the computer turns off. Press the power button again to restart the computer.

CHECK THE KEYBOARD CABLE —

- Ensure that the keyboard cable is firmly connected to the computer.
- Check the cable connector for bent or broken pins and for damaged or frayed cables. Straighten bent pins.
- Remove keyboard extension cables and connect the keyboard directly to the computer.

TEST THE KEYBOARD — Connect a properly working keyboard to the computer, and try using the keyboard. If the new keyboard works, the original keyboard is faulty.

CHECK THE KEYBOARD SWITCH SETTING — Some keyboards have switch settings that are on the bottom of the keyboard, sometimes behind a panel. Ensure that the switch is set to **PS/2**, **Enhanced XT/AT**, or **PC/AT**. See the keyboard documentation for recommended settings.

RUN THE DELL DIAGNOSTICS — Run the Dell Diagnostics. If any of the diagnostics tests fail, see "Contacting Dell".

CHECK FOR INTERRUPT REQUEST CONFLICTS — See Resolving Software and Hardware Incompatibilities.

Memory Problems

CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *System Information Guide*.

Fill out the Diagnostics Checklist as you complete these checks.

If you receive an insufficient memory message —

1 Save and close any open files and exit any open programs you are not using to see if that resolves the problem.

2 Confirm that the computer has sufficient memory to run your programs. See the software documentation for minimum memory requirements. If necessary, install additional memory.

3 Reseat the memory modules to ensure that your computer is successfully communicating with the memory.

4 Restart the computer.

5 Run the Dell Diagnostics. If any of the diagnostics tests fail, see "Contacting Dell".

If you experience other memory problems —

1 Reseat the memory modules to ensure that your computer is successfully communicating with the memory.

2 Restart the computer.

3 If the problem still exists, remove all the memory modules and install one memory module in memory module connector 4.

4 Restart the computer.

The following message appears: `Alert! Operating in Debug Mode. Please Populate Memory in Pairs for Normal Operation.`

5 Press <F1> to boot to the operating system.

6 Run the Dell Diagnostics.

7 If the memory module passes, shut down the computer, remove the memory module, and repeat the process with the remaining memory modules until a memory error occurs during start-up or diagnostic testing.

If the first memory module tested is defective, repeat the process with the remaining modules to ensure that the remaining modules are not defective.

8 When the defective memory module is identified, see "Contacting Dell" for a replacement.

NOTE: If necessary, the computer can operate in debug mode until new memory modules are installed.

Microprocessor Problems

⚠ **CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *System Information Guide*.**

Fill out the Diagnostics Checklist as you complete these checks.

IF YOU RECEIVE AN ERROR MESSAGE FOR THE MICROPROCESSOR —

- If two microprocessors are installed, ensure that they are identical. If the microprocessors aren't identical, you may receive an error message for the following:
  - – Different cache sizes
  - – Different speeds
  - – Different types

Enter system setup and ensure that values for **Processor 0** and **Processor 1** under the **CPU Information** option are identical:

- If two microprocessors are installed, ensure that a VRM is installed for the second microprocessor.
- Remove and reinstall the microprocessor.
- Run the System Board Devices and Processor Cache test groups in the Dell Diagnostics.

Verify that the VRM is working:

- If two microprocessors are installed, ensure that a VRM is properly installed for the second microprocessor.
- Reseat the second VRM (see VRM).
- Run the **System Board Devices** and **Processor Cache** test groups in the Dell Diagnostics.

Mouse Problems

Fill out the Diagnostics Checklist as you complete these checks.

RESTART THE COMPUTER —

1. Simultaneously press <Ctrl><Esc> to display the **Start** menu.
2. Type u, press the keyboard arrow keys to highlight **Shut down** or **Turn Off**, and then press <Enter>.
3. After the computer turns off, press the power button to restart the computer.

CHECK THE MOUSE CABLE —

- Check the cable connector for bent or broken pins and for damaged or frayed cables. Straighten bent pins.
- Ensure that the cable is firmly connected to the computer.

TEST THE MOUSE — Connect a properly working mouse to the computer, and try using the mouse. If the new mouse works, the original mouse was faulty.

CHECK THE MOUSE SETTINGS —

Windows® XP

1 Click the **Start** button, click **Control Panel**, and then click **Printers and Other Hardware**.

2 Click **Mouse**.

3 Try adjusting the settings.

Windows 2000

1 Click the **Start** button, point to **Settings**, and then click **Control Panel**.

2 Double-click the **Mouse** icon.

3 Try adjusting the settings.

If you are using a PS/2 mouse

1 Enter system setup and ensure that **Mouse Port** under the **Integrated Devices** option is set to **On**.

2 Exit system setup and restart the computer.

REINSTALL THE MOUSE DRIVER — See Reinstalling Drivers.

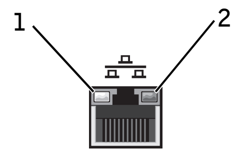
RUN THE Dell Diagnostics — If any of the diagnostics tests fail, see "Contacting Dell" for the number to call for assistance.

CHECK FOR INTERRUPT REQUEST CONFLICTS — See Resolving Software and Hardware Incompatibilities.

Network Problems

CHECK THE NETWORK CABLE CONNECTOR — Ensure that the network cable is firmly inserted into both the network connector on the back of the computer and the network jack.

CHECK THE NETWORK LIGHTS ON THE BACK OF THE COMPUTER — No light indicates that there is no network communication. Try replacing the network cable.



1	link integrity light
2	network activity light

RESTART THE COMPUTER AND TRY TO LOG ON TO THE NETWORK AGAIN

CHECK YOUR NETWORK SETTINGS — Contact your network administrator or the person who set up your network to verify that your network settings are correct and that the network is functioning.

CHECK FOR INTERRUPT REQUEST CONFLICTS — See Resolving Software and Hardware Incompatibilities.

Power Problems

CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *System Information Guide*.

Fill out the Diagnostics Checklist as you complete these checks.

ADJUST THE POWER PROPERTIES — Your computer may be in standby or hibernate mode. For information on power conservation modes, see your operating system documentation.

If the power light is green and the computer is not responding — See Diagnostic Lights.

If the power light is blinking green — The computer is in standby mode. Press a key on the keyboard or move the mouse to resume normal operation.

If the power light is off — The computer is either turned off or is not receiving power.

- Reseat the power cable into both the power connector on the back of the computer and the electrical outlet.
- If the computer is plugged into a power strip, ensure that the power strip is plugged into an electrical outlet and that the power strip is turned on.
- Ensure that the electrical outlet is working by testing it with another device, such as a lamp.
- Bypass power protection devices, power strips, and power extension cables to verify that the computer turns on.
- See Diagnostic Lights.
- If the problem persists, see "Contacting Dell".

If the power light is steady amber — The computer is receiving electrical power, but an internal power problem might exist.

- Ensure that the microprocessor power cable is securely connected to the system board.
- See Diagnostic Lights.
- If the problem persists, see "Contacting Dell".

If the power light is blinking amber — A device might be malfunctioning or incorrectly installed.

- Remove and then reinstall the memory modules.
- Remove and then reinstall any cards.
- Remove and then reinstall the video card, if applicable.
- See "Diagnostic Lights."
- If the problem persists, see "Contacting Dell".

ELIMINATE INTERFERENCE — Electrical appliances on the same circuit or operating near the computer can cause interference. Other causes of interference are:

- Power extension cables
- Keyboard and mouse extension cables
- Too many devices on a power strip
- Multiple power strips connected to the same electrical outlet

Printer Problems

NOTE: Dell does not cover the printer's warranty. If you need technical assistance for your printer, call the printer's manufacturer. See the printer documentation for the correct phone number.

CHECK THE PRINTER DOCUMENTATION — See the printer documentation for setup and troubleshooting information.

ENSURE THAT THE PRINTER IS TURNED ON — See the printer documentation for power button information.

VERIFY THE PRINTER CABLE CONNECTIONS —

- See the printer documentation for cable connection information.
- Ensure that the printer cables are securely connected to the printer and the computer.

TEST THE ELECTRICAL OUTLET — Ensure that the electrical outlet is working by testing it with another device, such as a lamp.

VERIFY THAT THE PRINTER IS RECOGNIZED BY WINDOWS® —

Windows XP

1 Click the **Start** button.

2 Click **Control Panel**.

3 Click **Printers and Other Hardware**.

4 Click **View installed printers or fax printers**.

If the printer is listed, right-click the printer icon.

5 Click **Properties,** and then select the **Ports** tab. For a parallel printer, ensure that the **Print to the following port(s):** setting is **LPT1 (Printer Port)**. For a USB printer, ensure that the **Print to the following port(s):** setting is **USB**.

Windows 2000

1 Click the **Start** button, point to **Settings**, and then click **Printers**.

If the printer is listed, right-click the printer icon.

2 Click **Properties,** and then select the **Ports** tab. For a parallel printer, ensure that the **Print to the following port(s):** setting is **LPT1 (Printer Port)**. For a USB printer, ensure that the **Print to the following port(s):** setting is **USB**.

REINSTALL THE PRINTER DRIVER — See Reinstalling Drivers.

Serial or Parallel Device Problems

Fill out the Diagnostics Checklist as you complete these checks.

NOTE: If you are having a problem with a printer, see "Printer Problems."

CHECK THE DOCUMENTATION FOR THE DEVICE — See the device's documentation for troubleshooting procedures.

ENSURE THAT THE DEVICE IS TURNED ON — Firmly press the device's power button.

CHECK THE DEVICE CABLE CONNECTIONS — Check the connector for bent or broken pins. (It is normal for most device cable connectors to have missing pins.) Ensure that the device cable is firmly connected to the computer.

TEST THE DEVICE CABLE — Swap the device's cable with a cable that works properly.

TEST THE ELECTRICAL OUTLET — Ensure that the electrical outlet is working by testing it with another device, such as a lamp.

ELIMINATE INTERFERENCE — Relocate any electrical appliances on the same circuit or operating near the computer that might cause interference. Remove these other possible causes of interference:

- Power extension cables
- Keyboard and mouse extension cables
- Too many devices on a power strip
- Multiple power strips connected to the same electrical outlet

CHECK THE OPTION SETTING — See the device's documentation for the recommended settings. Then enter system setup and go to the **Integrated Devices** option settings. Ensure that the **Serial Port** setting (for a serial device) or the **Parallel Port** setting (for a parallel device) matches the recommended settings.

CHECK THE SOFTWARE DOCUMENTATION — If the problem occurs with particular software, see the software documentation for the recommended serial or parallel port settings. Ensure that the port settings match the recommended settings.

RUN THE Dell Diagnostics — If the tests do not complete, see "Contacting Dell".

TEST THE DEVICE — Swap the device with a comparable device that works properly.

Sound and Speaker Problems

Fill out the Diagnostics Checklist as you complete these checks.

No sound from speakers

NOTE: The volume control in some MP3 players overrides the Windows® volume setting. If you have been listening to MP3 songs, ensure that you did not turn the player volume down or off.

CHECK THE SPEAKER CABLE CONNECTIONS — Ensure that the speakers are connected as shown on the setup diagram supplied with the speakers.

ENSURE THAT THE SUBWOOFER AND THE SPEAKERS ARE TURNED ON — See the setup diagram supplied with the speakers. If your speakers have volume controls, adjust the volume, bass, or treble to eliminate distortion.

ADJUST THE WINDOWS VOLUME CONTROL — Click or double-click the speaker icon in the lower-right corner of your screen. Ensure that the volume is turned up and that the sound is not muted.

DISCONNECT HEADPHONES FROM THE HEADPHONE CONNECTOR — Sound from the speakers is automatically disabled when headphones are connected to the computer's front-panel headphone connector.

TEST THE ELECTRICAL OUTLET — Ensure that the electrical outlet is working by testing it with another device, such as a lamp.

ELIMINATE POSSIBLE INTERFERENCE — Turn off nearby fans, fluorescent lights, or halogen lamps to check for interference.

RUN THE SPEAKER DIAGNOSTICS — Some speaker systems have self-diagnostics. See the speaker documentation for diagnostics instructions.

REINSTALL THE AUDIO (SOUND) DRIVER — See Reinstalling Drivers.

CHECK THE DEVICE OPTION SETTING — Enter system setup and ensure that **Sound** under the **Integrated Devices** option is set to **On**. Exit system setup and restart the computer.

RUN THE Dell Diagnostics —

- If the tests complete successfully, the controller is functioning properly.
- If the problem persists, or if the tests do not complete successfully, see "Contacting Dell".

CHECK FOR INTERRUPT REQUEST CONFLICTS — See Resolving Software and Hardware Incompatibilities.

No sound from headphones

CHECK THE HEADPHONE CABLE CONNECTION — Ensure that the headphone cable is securely inserted into the headphone connector.

ADJUST THE WINDOWS VOLUME CONTROL — Click or double-click the speaker icon in the lower-right corner of your screen. Ensure that the volume is turned up and that the sound is not muted.

DISABLE DIGITAL MODE — Your headphones do not work if the CD drive is operating in digital mode. To disable digital mode:

1. Click the **Start** button, click **Control Panel**, and then click **Sounds, Speech, and Audio Devices**.
2. Click **Sounds and Audio Devices**.
3. Click the **Hardware** tab.
4. Double-click the name of your CD drive.
5. Click the **Properties** tab.
6. Uncheck the **Enable digital CD audio for this CD-ROM device** box.

System Board Problems

Fill out the Diagnostics Checklist as you complete the following checks.

RUN THE DELL DIAGNOSTICS — Restart the computer and run the Dell Diagnostics. If any of the tests fail, see "Contacting Dell".

CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *System Information Guide*.

CHECK THE POWER SUPPLY CABLE CONNECTIONS —

1. Turn off the computer and devices, disconnect them from electrical outlets, wait 10 to 20 seconds, and then open the computer cover.
2. Ensure that the power cables from the power supply are firmly connected to the connectors on the system board.
3. Close the computer cover, reconnect the computer and devices to electrical outlets, and turn them on.

PERFORM ALL CHECKS IN "Card Problems"

PERFORM ALL CHECKS IN "Keyboard Problems"

CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *System Information Guide*.

REINSTALL THE BATTERY — 1 Turn off the computer and devices, disconnect them from electrical outlets, wait 10 to 20 seconds, and then open the computer.

2. Remove the battery, wait 5 minutes, and reinstall the battery.
3. Close the computer cover, reconnect the computer and devices to electrical outlets, and turn them on.

   If the problem still exists, see "Contacting Dell" for the number to call for assistance.

CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *System Information Guide*.

RESEAT THE MEMORY MODULES —

1 Turn off the computer and devices, disconnect them from electrical outlets, wait 10 to 20 seconds, and then open the computer cover.
2 Remove and replace the memory module(s).
3 Close the computer cover, reconnect the computer and devices to electrical outlets, and turn them on.
4 If the RAM count displayed does not correctly match the actual amount of memory installed in the computer, see "Contacting Dell".

Video and Monitor Problems

Fill out the Diagnostics Checklist as you complete these checks.

If the screen is blank

NOTE: See the monitor documentation for troubleshooting procedures.

CHECK THE MONITOR POWER LIGHT — If the power light is off, firmly press the button to ensure that the monitor is turned on. If the power light is lit or blinking, the monitor has power. If the power light is blinking, press a key on the keyboard or move the mouse.

CHECK THE MONITOR CABLE CONNECTION — Check the connector for bent or broken pins. (It is normal for monitor cable connectors to have missing pins.)

TEST THE ELECTRICAL OUTLET — Ensure that the electrical outlet is working by testing it with another device, such as a lamp.

SWAP THE POWER CABLES — Swap the computer and monitor power cables to determine if the power cable is defective.

TEST THE VIDEO EXTENSION CABLE (IF USED) — If you are using a video extension cable and removing the cable solves the problem, the cable is defective.

TEST ANOTHER MONITOR — If another monitor is available, connect it to the computer.

CHECK THE DIAGNOSTIC LIGHTS — See Diagnostic Lights.

CHECK THE CARD SETTING — Enter system setup and ensure that **Primary Video Controller** under the **Integrated Devices** option is set correctly. For an AGP card, set **Primary Video Controller** to **AGP**. For a PCI card, set **Primary Video Controller** to **Auto**. Exit system setup and restart the computer.

RUN THE Dell Diagnostics — If any tests fail, see "Contacting Dell".

If the screen is difficult to read

CHECK THE MONITOR SETTINGS — See the monitor documentation for instructions on adjusting the contrast and brightness, demagnetizing (degaussing) the monitor, and running the monitor self-test.

MOVE THE SUBWOOFER AWAY FROM THE MONITOR — If your speaker system includes a subwoofer, ensure that the subwoofer is at least 60 cm (2 ft) away from the monitor.

MOVE THE MONITOR AWAY FROM EXTERNAL POWER SOURCES —

Fans, fluorescent lights, halogen lamps, and other electrical devices can cause the screen image to appear "shaky." Turn off nearby devices to check for interference.

ADJUST THE WINDOWS® DISPLAY SETTINGS —

Windows XP

1 Click the **Start** button, and then click **Control Panel**.
2 Click **Appearance and Themes**.
3 Click **Display**, and then click the **Settings** tab.
4 Try different settings for **Screen resolution** and **Color quality.**

Windows 2000

1 Click the **Start** button, point to **Settings**, and then click **Control Panel**.
2 Double-click the **Display** icon, and then click the **Settings** tab.
3 Try different settings for **Screen area** or **Desktop area.**

RESTORE THE RECOMMENDED SETTINGS — Restore the original resolution and refresh rate settings.

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SECTION 20

Advanced Troubleshooting

Diagnostic Lights

System Lights

Located on the front of the computer, these lights can indicate a computer problem.

Power Light	Hard-Drive Light	Problem Description	Suggested Resolution
Solid green	N/A	Power is on, and the computer is operating normally.	No corrective action is required.
Blinking green	Blank	The computer is in the suspended state (Microsoft® Windows® 2000 and Windows XP).	Press the power button, move the mouse, or press a key on the keyboard to wake the computer. See "Power Button."
Blinks green several times and then turns off	N/A	A configuration error exists.	Check the diagnostic lights to see if the specific problem is identified.
Solid yellow	N/A	The Dell Diagnostics is running a test, or a device on the system board may be faulty or incorrectly installed.	If the Dell Diagnostics is running, allow the testing to complete. Check the diagnostic lights to see if the specific problem is identified. See "System Board Problems." If the computer does not boot, contact Dell for technical assistance.
Blinking yellow	Blank	A power supply or system board failure has occurred.	Check the diagnostic lights to see if the specific problem is identified. See "Power Problems" and "System Board Problems."
Blinking yellow	Solid green	A system board or VRM failure has occurred.	Check the diagnostic lights to see if the specific problem is identified. See "System Board Problems."
Solid green and a beep code during POST	N/A	A problem was detected while the BIOS was executing.	See "Beep Codes" for instructions on diagnosing the beep code. Also, check the diagnostic lights to see if the specific problem is identified.

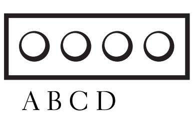
Power Light	Hard-Drive Light	Problem Description	Suggested Resolution
Solid green power light and no beep code and no video during POST	N/A	The monitor or the graphics card may be faulty or incorrectly installed.	Check the diagnostic lights to see if the specific problem is identified. See "Video and Monitor Problems."
Solid green power light and no beep code but the computer locks up during POST	N/A	An integrated system board device may be faulty.	Check the diagnostic lights to see if the specific problem is identified. If the problem is not identified, contact Dell for technical assistance.

Diagnostic Lights

To help you troubleshoot a problem, your computer is equipped with four lights on the front panel labeled "A," "B," "C," and "D". These lights can be yellow or green. When the computer starts normally, the lights flash. After the computer starts, the lights remain green. If the computer malfunctions, the color and sequence of the lights identify the problem.

CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *System Information Guide*.

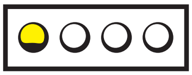
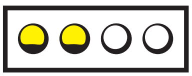
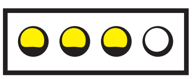
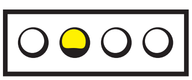
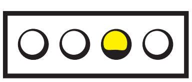
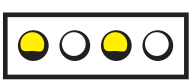
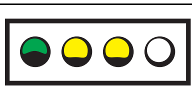
Diagnostic Light Codes Before POST

Light Pattern	Problem Description	Suggested Resolution
	No electrical power is supplied to the computer.	Connect the computer to its electrical outlet. Ensure that the front-panel power light is on. If the power light is off, ensure that the computer is connected to a working electrical outlet and then press the power button. If the problem is still not resolved, contact Dell for technical assistance.

 = yellow

 = green

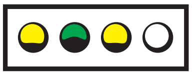
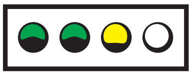
 = off

Light Pattern	Problem Description	Suggested Resolution
	The computer is in a normal off condition; the computer is connected to its electrical outlet.	Press the power button to turn the computer on. If the computer does not turn on, ensure that the front-panel power light is on. If the power light is off, ensure that the computer is connected to a working electrical outlet and then press the power button. If the problem is still not resolved, contact Dell for technical assistance.
	The computer is in a reduced power or "sleep" state.	Use one of the appropriate methods to "wake up" the computer. See "Advanced Features." If the problem is not resolved and you are trying to wake the computer with a USB mouse or keyboard, subsitute the mouse or keyboard with a working PS/2 mouse or keyboard and try to wake the computer.
	The BIOS is not executing.	Ensure that the microprocessor is seated correctly and restart the computer. If the problem is still not resolved, contact Dell for technical assistance.
	A possible power supply or power cable failure has occurred.	Perform the procedure in "Power Problems." If the problem is still not resolved, contact Dell for technical assistance.
	A possible system board failure has occured.	Contact Dell for technical assistance.
	A microprocessor and/or VRM mismatch exists.	Perform the procedure in "Microprocessor Problems."
	A possible VRM 0 failure has occurred.	Contact Dell for technical assistance.

 = yellow

 = green

 = off

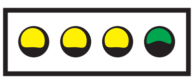
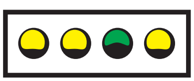
Light Pattern	Problem Description	Suggested Resolution
 A B C D	A possible VRM 1 failure has occurred.	Perform the procedure in "Microprocessor Problems."
 A B C D	A possible VRM 0 and VRM 1 failure has occurred.	Contact Dell for technical assistance.

 = yellow

 = green

 = off

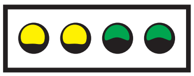
Diagnostic Light Codes During POST

Light Pattern	Problem Description	Suggested Resolution
 A B C D	A possible BIOS failure has occurred; the computer is in the recovery mode.	Run the BIOS Recovery Utility, wait for recovery completion, and then restart the computer.
 A B C D	A possible microprocessor failure has occurred.	Reinstall the microprocessor and restart the computer.

 = yellow

 = green

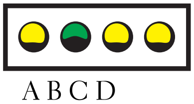
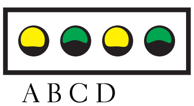
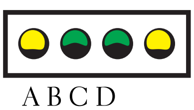
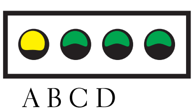
 = off

Light Pattern	Problem Description	Suggested Resolution
 A B C D	Memory modules are detected, but a memory failure has occurred.	**1** Reseat the memory modules to ensure that your computer is successfully communicating with the memory. **2** Restart the computer. **3** If the problem still exists, remove all the memory modules and install one memory module in memory module connector 4. **4** Restart the computer. The following message appears: `Alert! Operating in Debug Mode. Please Populate Memory in Pairs for Normal Operation.` **5** Press <F1> to boot to the operating system. **6** Run the Dell Diagnostics. **7** If the memory module passes, shut down the computer, remove the memory module, and repeat the process with the remaining memory modules until a memory error occurs during start-up or diagnostic testing. If the first memory module tested is defective, repeat the process with the remaining modules to ensure the remaining modules are not defective. **8** When the defective memory module is identified, contact Dell for a replacement. **NOTE:** If necessary, the computer can operate in debug mode until new memory modules are installed.

 = yellow

 = green

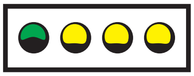
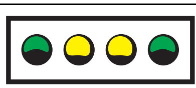
 = off

Light Pattern	Problem Description	Suggested Resolution
	A possible expansion card failure has occurred.	**1** Determine if a conflict exists by removing a card (not the video card) and then restarting the computer. **2** If the problem persists, reinstall the card that you removed, remove a different card, and then restart the computer. **3** Repeat this process for each card. If the computer starts normally, troubleshoot the last card removed from the computer for resource conflicts (see "Resolving Software and Hardware Incompatibilities"). **4** If the problem persists, contact Dell.
	A possible graphics card failure has occurred.	Reinstall the graphics card and restart the computer. If the problem still exists, install a graphics card that you know works and restart the computer. If the problem persists, contact Dell.
	A possible floppy or hard drive failure has occurred.	Check all power and data cable connections, and then restart the computer.
	A possible USB failure has occurred.	Reinstall all USB devices, check cable connections, and then restart the computer.

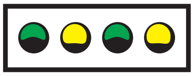
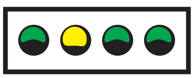
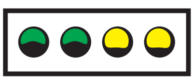
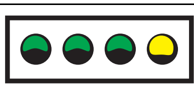
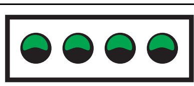
 = yellow

 = green

 = off

Light Pattern	Problem Description	Suggested Resolution
	No memory modules are detected.	**1** Reseat the memory modules to ensure that your computer is successfully communicating with the memory. **2** Restart the computer. **3** If the problem still exists, remove all the memory modules and install one memory module in memory module connector 4. **4** Restart the computer. The following message appears: `Alert! Operating in Debug Mode. Please Populate Memory in Pairs for Normal Operation.` **5** Press <F1> to boot to the operating system. **6** Run the Dell Diagnostics. **7** If the memory module passes, shutdown the computer, remove the memory module, and repeat the process with the remaining memory modules until a memory error occurs during start-up or diagnostic testing. If the first memory module tested is defective, repeat the process with the remaining modules to ensure the remaining modules are not defective. **8** When the defective memory module is identified, contact Dell for a replacement. **NOTE:** If necessary, the computer can operate in debug mode until new memory modules are installed.
	System board failure has occurred.	Perform the procedures in "System Board Problems." If the problem persists, contact Dell.

 = yellow
 = green
 = off

Light Pattern	Problem Description	Suggested Resolution
 A B C D	Memory modules are detected, but a memory configuration or compatibility error exists.	Ensure that there are no special memory module/memory connector placement requirements (see ""). Verify that the memory modules that you are installing are compatible with your computer (see ""). Reinstall the memory modules and then restart the computer. If the problem persists, contact Dell.
 A B C D	A possible system board resource and/or hardware failure has occurred.	Perform the procedure in "System Board Problems" and see "Resolving Software and Hardware Incompatibilities." If the problem persists, contact Dell.
 A B C D	A possible expansion card failure has occurred.	**1** Determine if a conflict exists by removing a card and then restarting the computer. **2** If the problem persists, reinstall the card that you removed, remove a different card, and then restart the computer. **3** Repeat this process for each card. If the computer starts normally, troubleshoot the last card removed from the computer for resource conflicts (see "Resolving Software and Hardware Incompatibilities"). **4** If the problem persists, contact Dell.
 A B C D	Other failure has occurred.	Ensure that the cables are properly connected from the hard drive, CD drive, and DVD drive to the system board. If the problem persists, contact Dell.
 A B C D	The computer is in a normal operating condition after POST.	None.
 = yellow  = green  = off		

Beep Codes

Your computer might emit a series of beeps that identify a problem. One possible series (code 1-3-1) consists of one beep, a burst of three beeps, and then one beep. This series tells you that the computer encountered a memory problem.

1 Write the beep code down on the Diagnostic Checklist.
2 Run the Dell Diagnostics to identify a more serious cause.
3 Contact Dell for technical assistance.

Code	Cause
1-1-2	Microprocessor register failure
1-1-3	NVRAM
1-1-4	ROM BIOS checksum failure
1-2-1	Programmable interval timer
1-2-2	DMA initialization failure
1-2-3	DMA page register read/write failure
1-3	Video Memory Test failure
1-3-1 through 2-4-4	DIMMs not being properly identified or used
3-1-1	Slave DMA register failure
3-1-2	Master DMA register failure
3-1-3	Master interrupt mask register failure
3-1-4	Slave interrupt mask register failure
3-2-2	Interrupt vector loading failure
3-2-4	Keyboard Controller Test failure
3-3-1	NVRAM power loss
3-3-2	NVRAM configuration
3-3-4	Video Memory Test failure
3-4-1	Screen initialization failure
3-4-2	Screen retrace failure
3-4-3	Search for video ROM failure

Code	Cause
4-2-1	No time tick
4-2-2	Shutdown failure
4-2-3	Gate A20 failure
4-2-4	Unexpected interrupt in protected mode
4-3-1	Memory failure above address 0FFFFh
4-3-3	Timer-chip counter 2 failure
4-3-4	Time-of-day clock stopped
4-4-1	Serial or parallel port test failure
4-4-2	Failure to decompress code to shadowed memory
4-4-3	Math-coprocessor test failure
4-4-4	Cache test failure

Dell Diagnostics

When to Use the Dell Diagnostics

If you experience a problem with your computer, perform the checks in "Solving Problems" and run the Dell Diagnostics before you contact Dell for technical assistance. Running the Dell Diagnostics may help you resolve the problem without contacting Dell. If you do contact Dell, the test results can provide important information for Dell's service and support personnel.

The Dell Diagnostics allows you to:

- Perform express, extended, or custom tests on one or all devices
- Select tests based on a symptom of the problem you are having
- Choose how many times a test is run
- Display test results
- Suspend testing if an error is detected
- Access online help information that describes the tests and devices
- Receive status messages that tell you whether tests completed successfully

- Receive error messages if problems are detected

Starting the Dell Diagnostics

It is recommended that you print these procedures before you begin.

NOTICE: Only use the Dell Diagnostics to test your Dell™ computer. Using this program with other computers can result in error messages.

Enter system setup, review your computer's configuration information, and ensure that the device you want to test displays in system setup and is active.

Start the Dell Diagnostics from either your hard drive or from the Drivers and Utilities CD (also known as the *ResourceCD*).

Starting the Dell Diagnostics From Your Hard Drive

1 Shut down and restart the computer.

2 When the DELL® logo appears, press <F12> immediately.

NOTE: If you receive a message stating that no Diagnostics utility partition has been found, follow the instructions to run the Dell Diagnostics from your Drivers and Utilities CD.

If you wait too long and the Microsoft® Windows® logo appears, continue to wait until you see the Windows desktop. Then shut down your computer through the **Start** menu and try again.

3 When the boot device list appears, highlight **Boot to Utility Partition** and press <Enter>.

4 When the Dell Diagnostics Main Menu appears, select the test you want to run.

Starting the Dell Diagnostics From the Drivers and Utilities CD

1 Insert the *Drivers and Utilities* CD into the CD drive.

2 Shut down and restart the computer.

When the DELL® logo appears, press <F12> immediately.

If you wait too long and the Windows logo appears, continue to wait until you see the Windows desktop. Then shut down your computer through the **Start** menu and try again.

NOTE: This feature changes the boot sequence for one time only. On the next start-up, the computer boots according to the devices specified in system setup.

3 When the boot device list appears, highlight **IDE CD-ROM Device** and press <Enter>.

4 Select the **IDE CD-ROM Device** option from the CD boot menu.

5 Select the **Boot from CD-ROM** option from the menu that appears.

6 Type `1` to start the ResourceCD menu.

7 Type `2` to start the Dell Diagnostics.

8 Select **Run the 32 Bit Dell Diagnostics** from the numbered list. If multiple versions are listed, select the version appropriate for your platform.

9 When the Dell Diagnostics Main Menu appears, select the test you want to run.

Dell Diagnostics Main Menu

1 After the Dell Diagnostics loads and the **Main Menu** screen appears, click the button for the option you want.

NOTE: The Service Tag number for your computer is located on the top of each test screen.

Option	Function
Express Test	Performs a quick test of devices. This test typically takes 10 to 20 minutes and requires no interaction on your part. Run Express Test first to increase the possibility of tracing the problem quickly.
Extended Test	Performs a thorough check of devices. This test typically takes an hour or more and requires you to answer questions periodically.
Custom Test	Tests a specific device. You can customize the tests you want to run.
Symptom Tree	Lists the most common symptoms encountered and allows you to select a test based on the symptom of the problem you are having.

2 If a problem is encountered during a test, a message displaying the error code and a description of the problem appear. Write down the error code and problem description and follow the instructions on the screen.

If you cannot resolve the error condition, contact Dell.

3 If you run a test from the **Custom Test** or **Symptom Tree** option, click the applicable tab described in the following table for more information.

Tab	Function

Results	Displays the results of the test and any error conditions encountered.
Errors	Displays error conditions encountered, error codes, and problem description.
Help	Describes the test and may indicate requirements for running the test.
Configuration	Displays your hardware configuration for the selected device. The Dell Diagnostics obtains your configuration information for all devices from system setup, memory, and various internal tests and displays it in the device list in the left pane of the screen. The device list may not display the names of all the components installed on your computer or all devices attached to your computer.
Parameters	Allows you to customize the test by changing the test settings.

4 When the tests are completed, if you are running the Dell Diagnostics from the *Drivers and Utilities* CD, remove the CD.

5 Close the test screen to return to the **Main Menu** screen. To exit the Dell Diagnostics and restart the computer, close the **Main Menu** screen.

Drivers

What Is a Driver?

A driver is a program that controls a device such as a printer, mouse, or keyboard. All devices require a driver program.

A driver acts like a translator between the device and the programs that use the device. Each device has its own set of specialized commands that only its driver recognizes.

Many drivers, such as the keyboard driver, come with your Microsoft® Windows® operating system. You may need to install drivers if:

- You upgrade your operating system.
- You reinstall your operating system.
- You connect or install a new device.

If you experience a problem with any device, perform the steps in the following sections to identify whether the driver is the source of your problem and if necessary, to update the driver.

Identifying Drivers

Windows XP

1. Click the **Start** button and click **Control Panel**.
2. In the **Control Panel** window, under **Pick a Category**, click **Performance and Maintenance**.
3. In the **Performance and Maintenance** window, click **System**.
4. In the **System Properties** window, click the **Hardware** tab.
5. Click **Device Manager**.
6. In the **Device Manager** window, scroll down the list to see if any device has an exclamation point (a yellow circle with a [!]) on the device icon.

   If an exclamation point is next to the device name, you may need to reinstall the driver or install a new driver.

Windows 2000

1. Click the **Start** button, point to **Settings**, and click **Control Panel**.
2. In the **Control Panel** window, double-click **System**.
3. In the **System Properties** window, click the **Hardware** tab.
4. Click **Device Manager**.
5. In the **Device Manager** window, scroll down the list to see if any device has an exclamation point (a yellow circle with a [!]) on the device icon.

   If an exclamation point is next to the device name, you may need to reinstall the driver or install a new driver.

Reinstalling Drivers

NOTICE: The Dell Support website and your *Dell Precision Drivers and Utilities* CD provide approved drivers for Dell™ computers. If you install drivers obtained from other sources, your computer might not work correctly.

NOTE: To access device drivers and user documentation, you must use the *Drivers and Utilities* CD while your computer is running Windows.

1 Insert the *Drivers and Utilities* CD into the CD drive.

   If this is your first time to use the *Drivers and Utilities* CD, the **Installation** window opens to inform you that the CD will begin the installation. Click **OK**, and respond to the installation program prompts to complete the installation.

2 Click **Next** at the **Welcome Dell System Owner** screen.

3 Choose the appropriate selections for **System Model**, **Operating System**, **Device Type**, and **Topic**.

4 Click **My Drivers** in the **Topic** drop-down menu.

   The Drivers and Utilities CD scans your computer's hardware and operating system and then displays a list of device drivers for your system configuration.

5 Click the appropriate driver and follow the instructions to download the driver for your computer.

To view a list of all available drivers for your computer, click **Drivers** in the **Topic** drop-down menu.

To access the Dell Drivers and Utilities CD Guide, click **User's Guides** in the **Topic** drop-down menu, and then click **Dell Precision ResourceCD**.

Using Windows XP Device Driver Rollback

If a problem occurs on your computer after you install or update a driver, use Windows XP Device Driver Rollback to replace the driver with the previously installed version.

To use Device Driver Rollback:

1 Click the **Start** button and click **Control Panel**.

2 In the **Control Panel** window, under **Pick a Category**, click **Performance and Maintenance**.

3 In the **Performance and Maintenance** window, click **System**.

4 In the **System Properties** window, click the **Hardware** tab.

5 Click **Device Manager**.

6 In the **Device Manager** window, right-click the device for which the new driver was installed, and then click **Properties**.

7 Click the **Drivers** tab.

8 Click **Roll Back Driver**.

If Device Driver Rollback does not resolve the problem, then use Using System Restore to return your operating system to the operating state it was in before you installed the new driver.

Using System Restore

The Microsoft® Windows® XP operating system provides System Restore to allow you to return your computer to an earlier operating state (without affecting data files) if changes to the hardware, software, or other system settings have left the computer in an undesirable operating state. See Windows Help for information on using System Restore.

NOTICE: Make regular backups of your data files. System Restore does not monitor your data files or recover them.

Creating a Restore Point

1 Click the **Start** button.

2 Click **Help and Support**.

3 Click **System Restore**.

4 Follow the instructions on the screen.

Restoring the Computer to an Earlier Operating State

If problems occur after installing a device driver, first try using Device Driver Rollback. If that is unsuccessful, then use System Restore.

NOTICE: Before restoring the computer to an earlier operating state, save and close all open files and close all open programs. Do not alter, open, or delete any files or programs until the system restoration is complete.

1 Click the **Start** button, point to **All Programs**→ **Accessories**→ **System Tools**, and then click **System Restore**.

2 Ensure that **Restore my computer to an earlier time** is selected, and then click **Next**.

3 Click a calendar date to which you want to restore your computer.

   The **Select a Restore Point** screen provides a calendar that allows you to see and select restore points. All calendar dates with available restore points appear in bold.

4 Select a restore point, and then click **Next**.

If a calendar date has only one restore point, then that restore point is automatically selected. If two or more restore points are available, click the restore point that you prefer.

5 Click **Next**.

The **Restoration Complete** screen appears after System Restore finishes collecting data, and then the computer automatically restarts.

6 After the computer restarts, click **OK**.

To change the restore point, you can either repeat the steps using a different restore point, or you can undo the restoration.

Undoing the Last System Restore

NOTICE: Before undoing the last system restore, save and close all open files and close all open programs. Do not alter, open, or delete any files or programs until the system restoration is complete.

1 Click the **Start** button, point to **All Programs** → **Accessories** → **System Tools**, and then click **System Restore**.

2 Select **Undo my last restoration** and click **Next**.

3 Click **Next**.

The **System Restore** screen appears, and then the computer automatically restarts.

4 After the computer restarts, click **OK**.

Enabling System Restore

If you reinstall Windows XP with less than 200 MB of free hard-disk space available, System Restore is automatically disabled. To see if System Restore is enabled:

1 Click the **Start** button, and then click **Control Panel**.

2 Click **Performance and Maintenance**.

3 Click **System**.

4 Click the **System Restore** tab.

5 Make sure that **Turn off System Restore** is unchecked.

Resolving Software and Hardware Incompatibilities

Windows XP

Microsoft® Windows® XP IRQ conflicts occur if a device either is not detected during the operating system setup or is detected but incorrectly configured.

To check for conflicts on a computer running Windows XP:

1. Click the **Start** button, and then click **Control Panel**.
2. Click **Performance and Maintenance**, and then click **System**.
3. Click the **Hardware** tab, and then click **Device Manager**.
4. In the **Device Manager** list, check for conflicts with the other devices.

   Conflicts are indicated by a yellow exclamation point (`!`) beside the conflicting device or a red `X` if the device has been disabled.
5. Double-click any conflicting device listed to bring up the **Properties** window to determine what needs to be reconfigured or removed from the Device Manager.

   Resolve these conflicts before checking specific devices.
6. Double-click the malfunctioning device type in the **Device Manager** list.
7. Double-click the icon for the specific device in the expanded list.

   The **Properties** window appears.
8. Resolve any IRQ conflicts, as described in step 5.

   If an IRQ conflict exists, the **Device** status area in the **Properties** window reports the cards or devices that share the device's IRQ.

To use the Windows XP Hardware Troubleshooter:

1. Click the **Start** button, and then click **Help and Support**.
2. Type `hardware troubleshooter` in the **Search** field, and then click the arrow to start the search.
3. Click **Hardware Troubleshooter** in the **Search Results** list.
4. In the **Hardware Troubleshooter** list, click **I need to resolve a hardware conflict on my computer**, and then click **Next**.

Windows 2000

To check for conflicts on a computer running Windows 2000:

1. Click the **Start** button, point to **Settings**, and click **Control Panel**.
2. In the **Control Panel** window, double-click **System**.
3. Click the **Hardware** tab.
4. Click **Device Manager**.
5. Click **View**, and then click **Resources by connection**.
6. Double-click **Interrupt request (IRQ)** to view the IRQ assignments.

   Conflicts are indicated by a yellow exclamation point (`!`) beside the conflicting device or a red `X` if the device has been disabled.
7. Double-click any conflicting device listed to bring up the **Properties** window to determine what needs to be reconfigured or removed from the Device Manager. Resolve these conflicts before checking specific devices.
8. Double-click the malfunctioning device type in the **Device Manager** list.
9. Double-click the icon for the specific device in the expanded list.

   The **Properties** window appears.
10. If an IRQ conflict exists, the **Device status** area in the **Properties** window reports the cards or devices that share the device's IRQ. Resolve the IRQ conflicts.

To use the Windows 2000 Hardware Troubleshooter:

1. Click the **Start** button, and then click **Help**.
2. Click **Troubleshooting and Maintenance** on the **Contents** tab, click **Windows 2000 troubleshooters**, and then click **Hardware**.
3. In the **Hardware Troubleshooter** list, click **I need to resolve a hardware conflict on my computer**, and then click **Next**.

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SECTION 21

Cleaning Your Computer

Before Cleaning Your Computer

CAUTION: Before you begin any of the procedures in this section, follow the safety instructions in the *System Information Guide*.

1 Shut down the computer through the **Start** menu.

2 Ensure that your computer and attached devices are turned off. If your computer and attached devices did not automatically turn off when you shut down your computer, turn them off now.

NOTICE: To disconnect a network cable, first unplug the cable from your computer and then unplug it from the network wall jack.

3 Disconnect any telephone or telecommunication lines from the computer.

4 Disconnect your computer and all attached devices from electrical outlets, and then press the power button to ground the system board.

Computer, Keyboard, and Monitor

- Use a vacuum cleaner with a brush attachment to remove dust from the slots and holes on your computer and between the keys on the keyboard.

NOTICE: Do not wipe the monitor screen with any soap or alcohol solution. Doing so may damage the antiglare coating.

- To clean your monitor screen, lightly dampen a soft, clean cloth with water. If possible, use a special screen-cleaning tissue or solution suitable for the monitor's antistatic coating.
- Wipe the keyboard, computer, and plastic part of the monitor with a soft cleaning cloth moistened with a solution of three parts water and one part liquid dishwashing detergent. Wipe off stubborn stains with a cloth lightly moistened with isopropyl alcohol.

  Do not soak the cloth in the solution or let the solution drip inside your computer or keyboard.

Mouse

If your screen cursor skips or moves abnormally, clean the mouse. To clean a non-optical mouse:

1 Turn the retainer ring on the underside of your mouse counterclockwise, and then remove the ball.

2 Wipe the ball with a clean, lint-free cloth.

3 Blow carefully into the ball cage to dislodge dust and lint.

4 If there is a buildup of dirt on the rollers inside the ball cage, clean the rollers with a cotton swab moistened lightly with isopropyl alcohol.

5 Recenter the rollers in their channels if they are misaligned. Ensure that fluff from the swab is not left on the rollers.

6 Replace the ball and retainer ring. Turn the retainer ring clockwise until it clicks into place.

Floppy Drive

NOTICE: Do not attempt to clean drive heads with a swab. You might accidentally misalign the heads, which prevents the drive from operating.

Clean your floppy drive using a commercially available cleaning kit. These kits contain pretreated floppy disks to remove contaminants that accumulate during normal operation.

CDs and DVDs

1 Hold the disc by its outer edge. It is okay to touch the inside edge of the center hole.

NOTICE: To prevent damaging the surface, do not wipe in a circular motion around the disc.

2 With a soft, lint-free cloth, gently wipe the bottom of the disc (the unlabeled side) in a straight line from the center to the outer edge of the disc.

For stubborn dirt, try using water or a diluted solution of water and mild soap. You can also purchase commercial products that clean discs and provide some protection from dust, fingerprints, and scratches. Cleaning products for CDs are safe to use on DVDs.

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SECTION 22

Ergonomic Computing Habits

CAUTION: Improper or prolonged keyboard use may result in injury.

CAUTION: Viewing the monitor screen for extended periods of time may result in eye strain.

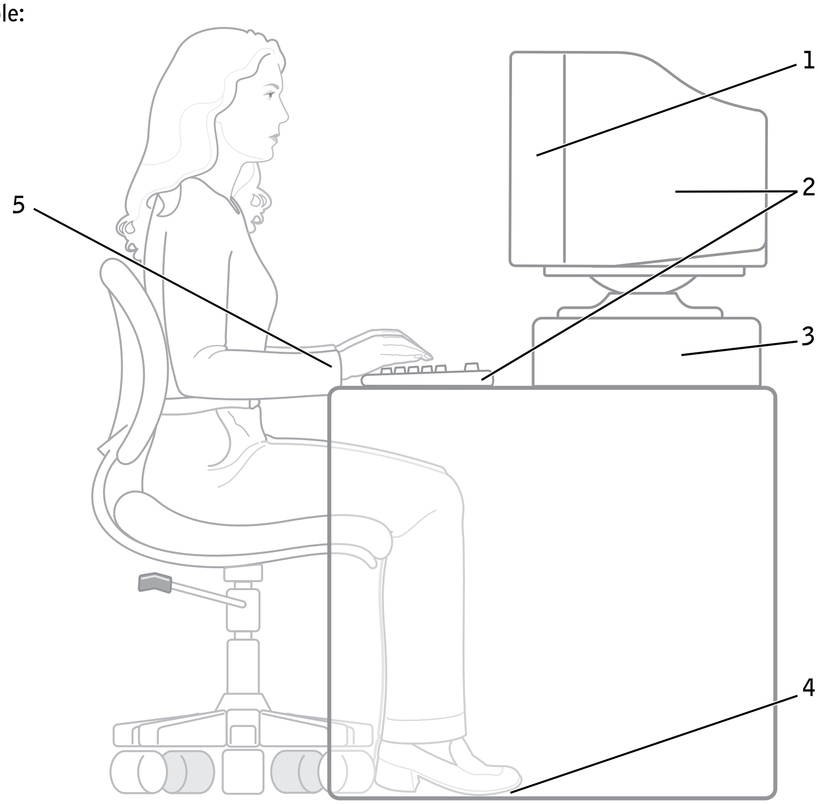
For comfort and efficiency, observe the following ergonomic guidelines when setting up and using your computer workstation:

- Position your computer so that the monitor and keyboard are directly in front of you as you work. Special shelves are commercially available to help you correctly position your keyboard.
- Set the monitor at a comfortable viewing distance (usually 450 to 610 millimeters [18 to 24 inches] from your eyes).
- Make sure the monitor screen is at eye level or slightly lower when you are sitting in front of the monitor.
- Adjust the tilt of the monitor, its contrast and brightness settings, and the lighting around you (such as overhead lights, desk lamps, and the curtains or blinds on nearby windows) to minimize reflections and glare on the monitor screen.
- Use a chair that provides good lower back support.
- Keep your forearms horizontal with your wrists in a neutral, comfortable position while using the keyboard or mouse.
- Always leave space to rest your hands while using the keyboard or mouse.
- Let your upper arms hang naturally at your sides.
- Ensure that your feet are resting flat on the floor.

- When sitting, make sure the weight of your legs is on your feet and not on the front of your chair seat. Adjust your chair's height or use a footrest, if necessary, to maintain proper posture.
- Vary your work activities. Try to organize your work so that you do not have to type for extended periods of time. When you stop typing, try to do things that use both hands.

For more information about ergonomic computing habits, see the BSR/HFES 100 standard, which can be purchased on the Human Factors and Ergonomics Society (HFES) website at: **www.hfes.org/publications/HFES100.html**

Example:



1	monitor screen at or below eye level	4	feet flat on the floor
2	monitor and keyboard positioned directly in front of the user	5	wrists relaxed and flat
3	monitor stand		

References:

1. American National Standards Institute. *ANSI/HFES 100: American National Standards for Human Factors Engineering of Visual Display Terminal Workstations*. Santa Monica, CA: Human Factors Society, Inc., 1988.

2. Human Factors and Ergonomics Society. *BSR/HFES 100 Draft standard for trial use: Human Factors Engineering of Computer Workstations.* Santa Monica, CA: Human Factors and Ergonomics Society, 2002.

3. International Organization for Standardization (ISO). *ISO 9241 Ergonomics requirements for office work with visual display terminals (VDTs)*. Geneva, Switzerland: International Organization for Standardization, 1992.

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SECTION 23

Your Operating System

Reinstalling Microsoft® Windows® XP

NOTE: See Advanced Troubleshooting for information on identifying drivers, creating a restore point, and resolving software and hardware incompatibilities.

Before You Reinstall

If you are considering reinstalling the Windows XP operating system to correct a problem with a newly installed driver, use System Restore to return your operating system to the operating state it was in before you installed the new device driver.

NOTICE: Before performing the installation, back up all data files on your primary hard drive. For conventional hard drive configurations, the primary hard drive is the first drive detected by the computer.

To reinstall Windows XP, you need the following items:

- Dell *Operating System* CD
- Dell *Drivers and Utilities* CD

NOTE: The Dell *Drivers and Utilities* CD contains drivers that were factory-installed during assembly of the computer. Use the *Drivers and Utilities* CD to load any required drivers, including those drivers required if your computer has a redundant array of independent disks (RAID) controller.

- Product Key (Product ID Number) ____________________

NOTE: The Product Key is the bar code number on the sticker that is located on the external side cover of your computer. You may be prompted for the Product Key when using the *Operating System* CD under certain conditions.

Reinstalling Windows XP

To reinstall Windows XP, perform all the steps in the following sections in the order in which they are listed.

The reinstallation process can take 1 to 2 hours to complete. After you reinstall the operating system, you must also reinstall the device drivers, virus protection program, and other software.

NOTICE: The *Operating System* CD provides options for reinstalling Windows XP. The options can overwrite files and possibly affect programs installed on your hard drive. Therefore, do not reinstall Windows XP unless instructed to do so by a Dell technical support representative.

NOTICE: To prevent conflicts with Windows XP, disable any virus protection software installed on your computer before you reinstall Windows XP. See the documentation that came with the software for instructions.

Booting From the Operating System CD

1. Save and close any open files and exit any open programs.
2. Insert the *Operating System* CD. If any program starts automatically, exit the program before proceeding.
3. Shut down the computer through the **Start** menu and restart the computer.
4. Press <F12> immediately after the DELL™ logo appears.

   If the operating system logo appears, wait until you see the Windows desktop, and then shut down the computer and try again.
5. Press the arrow keys to select **CD-ROM**, and then press <Enter>.
6. When the `Press any key to boot from CD` message appears, press any key.

Windows XP Setup

1. When the **Windows XP Setup** screen appears, press <Enter> to select **To set up Windows now**.
2. Read the information on the **Microsoft Windows Licensing Agreement** screen, and press <F8> to accept the license agreement.
3. If your computer already has Windows XP installed and you want to recover your current Windows XP data, type `r` to select the repair option, and then remove the CD from the drive.
4. If you want to install a new copy of Windows XP, press <Esc> to select that option.
5. Press <Enter> to select the highlighted partition (recommended), and then follow the instructions on the screen.

   The **Windows XP Setup** screen appears, and the operating system begins to copy files and install the devices. The computer automatically restarts multiple times.

NOTE: The time required to complete the setup depends on the size of the hard drive and the speed of your computer.

NOTICE: Do not press any key when the following message appears: `Press any key to boot from the CD`.

6. When the **Regional and Language Options** screen appears, select the settings for your location, and then click **Next**.
7. Enter your name and organization (optional) in the **Personalize Your Software** screen and click **Next**.

8 *If you are reinstalling Windows XP Home Edition*, at the **What's your computer's name** window, enter a name for your computer (or accept the name provided) and click **Next**.

   If you are reinstalling Windows XP Professional, at the **Computer Name and Administrator Password** window, enter a name for your computer (or accept the one provided) and a password, and then click **Next**.

9 If the **Modem Dialing Information** screen appears, enter the requested information and click **Next**.

10 Enter the date, time, and time zone in the **Date and Time Settings** window and click **Next**.

11 If the **Networking Settings** screen appears, click **Typical** and click **Next**.

12 If you are reinstalling Windows XP Professional and you are prompted to provide further information regarding your network configuration, enter your selections. If you are unsure of your settings, accept the default selections.

   Windows XP installs the operating system components and configures the computer. The computer automatically restarts.

NOTICE: Do not press any key when the following message appears: `Press any key to boot from the CD.`

13 When the **Welcome to Microsoft** screen appears, click **Next**.

14 When the `How will this computer connect to the Internet?` message appears, click **Skip**.

15 When the **Ready to register with Microsoft?** screen appears, select **No, not at this time** and click **Next**.

16 When the **Who will use this computer?** screen appears, you can enter up to five users. Click **Next**.

17 Click **Finish** to complete the setup, and remove the CD from the drive.

18 Reinstall the appropriate drivers using the ResourceCD.

19 Reinstall your virus protection software.

Reinstalling Microsoft Windows 2000

NOTICE: The *Operating System* CD provides options for reinstalling Windows XP. The options can overwrite files and possibly affect programs installed on your hard drive. Therefore, do not reinstall Windows XP unless instructed to do so by a Dell technical support representative.

The reinstallation process can take 1 to 2 hours to complete. After you reinstall the operating system, you must also reinstall the device drivers, virus protection program, and other software.

1 Save and close any open files and exit any open programs.

2 Insert the *Operating System* CD. If any program starts automatically, exit the program before proceeding.

3 Shut down the computer through the **Start** menu and restart the computer.

4 Press <F12> immediately after the DELL™ logo appears.

   If the operating system logo appears, wait until you see the Windows desktop, and then shut down the computer and try again.

5 Press the arrow keys to select **CD-ROM**, and then press <Enter>.

6 When the `Press any key to boot from CD` message appears, press any key.

7 When the **Windows 2000 Setup** window appears, ensure that **To setup Win2000 now, press ENTER** is highlighted. Then press <Enter>.

8 When the **Windows 2000 Professional Setup** window appears, press the arrow keys to select the Windows 2000 partition option that you want. Then press the key for the partition option you chose.

9 When the **Windows 2000 Professional Setup** window reappears, press the arrow keys to select the type of file system that you want Windows 2000 to use, and then press <Enter>.

10 Press <Enter> again to restart your computer.

11 Click **Next** when the **Welcome to the Windows 2000 Setup Wizard** window appears.

12 When the **Regional Settings** window appears, select your region, and then click **Next**.

13 Enter your name and organization in the **Personalize Your Software** window, and then click **Next**.

14 Enter the Windows product key, which is printed on the Microsoft label on your computer. Then click **Next**.

15 When the **Computer Name and Administrator Password** window appears, enter a name for your computer and a password, if desired. Then click **Next**.

16 Enter the date and time in the **Date and Time Settings** window, and then click **Next**.

   Windows 2000 installs components and configures the computer.

17 When the **Completing the Windows 2000 Setup Wizard** window appears, remove the CD from the drive, and then click **Finish**.

The computer automatically restarts.

18 Reinstall the appropriate drivers using the *ResourceCD*.

19 Reinstall your virus protection software.

Microsoft Windows XP Features

Transferring Information to a New Computer

The Microsoft® Windows® XP operating system provides a Files and Settings Transfer wizard to move data from the source computer to the new computer. You can move data such as:

- E-mails
- Toolbar settings
- Window sizes
- Internet bookmarks

You can transfer the data to the new computer over a network or serial connection, or you can store it on a removable medium, such as a writable CD or floppy disk.

To prepare the new computer for the file transfer:

1. Click the **Start** button, point to **All Programs**→ **Accessories**→ **System Tools**, and then click **Files and Settings Transfer Wizard**.
2. When the **Files and Settings Transfer Wizard** welcome screen appears, click **Next**.
3. On the **Which computer is this?** screen, click **New Computer** and click **Next**.
4. On the **Do you have a Windows XP CD?** screen, click **I will use the wizard from the Windows XP CD** and click **Next**.
5. When the **Now go to your old computer** screen appears, go to your old or source computer. *Do not* click **Next** at this time.

To copy data from the old computer:

1. On the old computer, insert the Windows XP *Operating System* CD.
2. On the **Welcome to Microsoft Windows XP** screen, click **Perform additional tasks**.

3 Under **What do you want to do?**, click **Transfer files and settings**.

4 On the **Files and Settings Transfer Wizard** welcome screen, click **Next**.

5 On the **Which computer is this?** screen, click **Old Computer** and click **Next**.

6 On the **Select a transfer method** screen, click the transfer method you prefer.

7 On the **What do you want to transfer?** screen, select the items you want to transfer and click **Next**.

   After the information has been copied, the **Completing the Collection Phase** screen appears.

8 Click **Finish**.

To transfer data to the new computer:

1 On the **Now go to your old computer** screen on the new computer, click **Next**.

2 On the **Where are the files and settings?** screen, select the method you chose for transferring your settings and files and click **Next**.

   The wizard reads the collected files and settings and applies them to your new computer.

   When all of the settings and files have been applied, the **Finished** screen appears.

3 Click **Finished** and restart the new computer.

Switching to Classic View

NOTE: The procedures in this help file were written for the Windows default view, so the options might be different if you switch to the classic view.

You can change the Control Panel, the **Start** menu, and the Microsoft® Windows® desktop so they look like they did in previous versions of the Windows operating system.

Control Panel

1 Click the **Start** button and click **Control Panel**.

2 Click **Switch to Classic View** or **Switch to Category View** in the upper-left area of the **Control Panel** window.

Start Menu

1 Right-click an empty area on the taskbar.

2 Click **Properties** and click the **Start Menu** tab.

3 Click **Classic Start Menu** and click **OK**.

Desktop Themes

1 Right-click anywhere on the main desktop screen and click **Properties**.

2 On the **Themes** tab, click **Windows Classic** in the drop-down menu.

3 To customize color, font, and other classic desktop options, click the **Appearance** tab and click **Advanced**.

4 When you have made your selections, click **OK**.

Desktop Cleanup Wizard

By default, the Desktop Cleanup Wizard moves desktop icons that are not frequently used from your desktop to a designated folder 7 days after you first start your computer and every 60 days after that. The appearance of the **Start** menu changes as desktop icons are moved.

To turn off the Desktop Cleanup Wizard:

1 Right-click an empty spot on the desktop and click **Properties**.

2 Click the **Desktop** tab and click **Customize Desktop**.

3 Click **Run Desktop Cleanup Wizard every 60 days** to remove the check mark.

4 Click **OK**.

To run the Desktop Cleanup Wizard at any time:

1 Right-click an empty spot on the desktop and click **Properties**.

2 Click the **Desktop** tab and click **Customize Desktop**.

3 Click **Clean Desktop Now**.

4 When the **Desktop Cleanup Wizard** screen appears, click **Next**.

5 To leave an icon on the desktop, click the icon name to remove the check mark, and then click **Next**.

6 Click **Finish** to remove the shortcuts and close the wizard.

Internet Connection Firewall

The Internet Connection Firewall provides basic protection from unauthorized access to the computer while the computer is connected to the Internet. The firewall is automatically enabled when you run the Network Setup Wizard. When the firewall is enabled for a network connection, the firewall icon appears with a red background in the **Network Connections** section of the Control Panel.

Note that enabling the Internet Connection Firewall does not reduce the need for virus-checking software.

For more information, see the Help and Support Center (Microsoft® Windows® XP).

Setting Up a Home and Office Network

Network Setup Wizard

The Microsoft® Windows® XP operating system provides a Network Setup Wizard to guide you through the process of sharing files, printers, or an Internet connection between computers in a home or small office.

1. Click the **Start** button, point to **All Programs**→ **Accessories**→ **Communications**, and then click **Network Setup Wizard**.
2. On the welcome screen, click **Next**.
3. Click **Checklist for creating a network**.

NOTE: Selecting the connection method **This computer connects directly to the Internet** enables the integrated firewall provided with Windows XP.

4. Complete the checklist and required preparations.
5. Return to the Network Setup Wizard and follow the instructions on the screen.

User Accounts and Fast User Switching

Adding User Accounts

After the Microsoft® Windows® XP operating system is installed, the administrator or a user with administrator rights can create additional user accounts.

1. Click the **Start** button and click **Control Panel**.
2. In the **Control Panel** window, click **User Accounts**.
3. Under **Pick a task**, click **Create a new account**.

4 Under **Name the new account**, type the name of the new user and click **Next**.

5 Under **Pick an account type**, click one of the following options:

- **Computer administrator** — You can change all computer settings.
- **Limited** — You can change only your own personal settings, such as your password. You cannot install programs or use the Internet.

NOTE: Additional options may be available, depending on whether you are using Windows XP Home Edition or Windows XP Professional. Also, options available in Windows XP Professional vary depending on whether your computer is connected to a domain.

6 Click **Create Account**.

Fast User Switching

NOTE: Fast User Switching is unavailable if your computer is running Windows XP Professional and is a member of a computer domain, or if your computer has less than 128 MB of memory.

Fast User Switching allows multiple users to access one computer without requiring the previous user to log off.

1 Click the **Start** button and click **Log Off**.

2 In the **Log Off Windows** window, click **Switch User**.

When you use Fast User Switching, programs that previous users were using remain running in the background, which might decrease your computer's response time. Also, multimedia programs, such as games and DVD software, might not work with Fast User Switching. For more information, see the Windows Help and Support Center.

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SECTION 24

Regulatory Notices

Electromagnetic Interference (EMI) is any signal or emission, radiated in free space or conducted along power or signal leads, that endangers the functioning of a radio navigation or other safety service or seriously degrades, obstructs, or repeatedly interrupts a licensed radio communications service. Radio communications services include but are not limited to AM/FM commercial broadcast, television, cellular services, radar, air-traffic control, pager, and Personal Communication Services (PCS). These licensed services, along with unintentional radiators such as digital devices, including computer systems, contribute to the electromagnetic environment.

Electromagnetic Compatibility (EMC) is the ability of items of electronic equipment to function properly together in the electronic environment. While this computer system has been designed and determined to be compliant with regulatory agency limits for EMI, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference with radio communications services, which can be determined by turning the equipment off and on, you are encouraged to try to correct the interference by one or more of the following measures:

- Reorient the receiving antenna.
- Relocate the computer with respect to the receiver.
- Move the computer away from the receiver.
- Plug the computer into a different outlet so that the computer and the receiver are on different branch circuits.

If necessary, consult a Dell Technical Support representative or an experienced radio/television technician for additional suggestions.

Dell™ computer systems are designed, tested, and classified for their intended electromagnetic environment. These electromagnetic environment classifications generally refer to the following harmonized definitions:

- Class A is typically for business or industrial environments.
- Class B is typically for residential environments.

Information Technology Equipment (ITE), including peripherals, expansion cards, printers, input/output (I/O) devices, monitors, and so on, that are integrated into or connected to the system should match the electromagnetic environment classification of the computer system.

A Notice About Shielded Signal Cables: Use only shielded cables for connecting peripherals to any Dell device to reduce the possibility of interference with radio communications services. Using shielded cables ensures that you maintain the appropriate EMC classification for the intended environment. For parallel printers, a cable is available from Dell. If you prefer, you can order a cable from Dell on the World Wide Web at accessories.us.dell.com/sna/category.asp?category_id=4117.

Most Dell computer systems are classified for Class B environments. However, the inclusion of certain options can change the rating of some configurations to Class A. To determine the electromagnetic classification for your system or device, see the following sections specific for each regulatory agency. Each section provides country-specific EMC/EMI or product safety information.

FCC Notices (U.S. Only)

Most Dell computer systems are classified by the Federal Communications Commission (FCC) as Class B digital devices. To determine which classification applies to your computer system, examine all FCC registration labels located on the bottom, side, or back panel of your computer, on card-mounting brackets, and on the cards themselves. If any one of the labels carries a Class A rating, your entire system is considered to be a Class A digital device. If *all* labels carry an FCC Class B rating as distinguished by either an FCC ID number or the FCC logo, (FC), your system is considered to be a Class B digital device.

Once you have determined your system's FCC classification, read the appropriate FCC notice. Note that FCC regulations provide that changes or modifications not expressly approved by Dell could void your authority to operate this equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

Class A

This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the manufacturer's instruction manual, may cause harmful interference with radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case you will be required to correct the interference at your own expense.

Class B

This equipment has been tested and found to comply with the limits for a Class B digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the manufacturer's instruction manual, may cause interference with radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, you are encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/television technician for help.

The following information is provided on the device or devices covered in this document in compliance with FCC regulations:

- Model number: WHL and WHM
- Company name:

  Dell Computer Corporation
  One Dell Way
  Round Rock, Texas 78682 USA
  512-338-4400

IC Notice (Canada Only)

Most Dell computer systems (and other Dell digital apparatus) are classified by the Industry Canada (IC) Interference-Causing Equipment Standard #3 (ICES-003) as Class B digital devices. To determine which classification (Class A or B) applies to your computer system (or other Dell digital apparatus), examine all registration labels located on the bottom, side, or the back panel of your computer (or other digital apparatus). A statement in the form of "IC Class A ICES-003" or "IC Class B ICES-003" will be located on one of these labels. Note that Industry Canada regulations provide that changes or modifications not expressly approved by Dell could void your authority to operate this equipment.

This Class B (or Class A, if so indicated on the registration label) digital apparatus meets the requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la Classe B (ou Classe A, si ainsi indiqué sur l'étiquette d'enregistration) respecte toutes les exigences du Reglement sur le Materiel Brouilleur du Canada.

CE Notice (European Union)

Marking by the symbol CE indicates compliance of this Dell computer to the EMC Directive and the Low Voltage Directive of the European Union. Such marking is indicative that this Dell system meets the following technical standards:

- EN 55022 — "Information Technology Equipment — Radio Disturbance Characteristics — Limits and Methods of Measurement."
- EN 55024 — "Information Technology Equipment - Immunity Characteristics - Limits and Methods of Measurement."
- EN 61000-3-2 — "Electromagnetic Compatibility (EMC) - Part 3: Limits - Section 2: Limits for Harmonic Current Emissions (Equipment Input Current Up to and Including 16 A Per Phase)."
- EN 61000-3-3 — "Electromagnetic Compatibility (EMC) - Part 3: Limits - Section 3: Limitation of Voltage Fluctuations and Flicker in Low-Voltage Supply Systems for Equipment With Rated Current Up to and Including 16 A."
- EN 60950 — "Safety of Information Technology Equipment."

- EN 55022 — "Information Technology Equipment — Radio Disturbance Characteristics — Limits and Methods of Measurement."
- EN 50082-1 — "Electromagnetic Compatibility - Generic Immunity Standard - Part 1: Residential, Commercial and Light Industry."
- EN 50082-2 — "Electromagnetic Compatibility - Generic Immunity Standard - Part 2: Industrial Environment."
- EN 60950 — "Safety of Information Technology Equipment."

NOTE: EN 55022 emissions requirements provide for two classifications:

- Class A is for typical commercial areas.
- Class B is for typical domestic areas.

This Dell device is classified for use in a typical Class B domestic environment.

A "Declaration of Conformity" in accordance with the preceding directives and standards has been made and is on file at Dell Computer Corporation Products Europe BV, Limerick, Ireland.

ENERGY STAR® Compliance

Certain configurations of Dell computers comply with the requirements set forth by the Environmental Protection Agency (EPA) for energy-efficient computers. If the front panel of your computer bears the ENERGY STAR® Emblem, your original configuration complies with these requirements and all ENERGY STAR® power management features of the computer are enabled.

NOTE: Any Dell computer bearing the ENERGY STAR® Emblem is certified to comply with EPA ENERGY STAR® requirements as configured when shipped by Dell. Any changes you make to this configuration (such as installing additional expansion cards or drives) may increase the computer's power consumption beyond the limits set by the EPA's ENERGY STAR® Computers program.

ENERGY STAR® Emblem

The EPA's ENERGY STAR® Computers program is a joint effort between the EPA and computer manufacturers to reduce air pollution by promoting energy-efficient computer products. The EPA estimates that use of ENERGY STAR® computer products can save computer users up to two billion dollars annually in electricity costs. In turn, this reduction in electricity usage can reduce emissions of carbon dioxide, the gas primarily responsible for the greenhouse effect, and sulfur dioxide and nitrogen oxides, the primary causes of acid rain.

You can also help reduce electricity usage and its side effects by turning off your computer when it is not in use for extended periods of time, particularly at night and on weekends.

Simplified Chinese Class A Warning Notice (China Only)

On Class A systems, the following warning will appear near the regulatory label:

Warning: This is a Class A product. In a domestic environment this product may cause radio interference, in which case the user may be required to take adequate measures.

声明

此为 A 级产品，在生活环境中，该产品可能会造成无线电干扰。
在这种情况下，可能需要用户对其干扰采取切实可行的措施。

EN 55022 Compliance (Czech Republic Only)

This device belongs to Class B devices as described in EN 55022, unless it is specifically stated that it is a Class A device on the specification label. The following applies to devices in Class A of EN 55022 (radius of protection up to 30 meters). The user of the device is obliged to take all steps necessary to remove sources of interference to telecommunication or other devices.

Pokud není na typovém štitku počítače uvedeno, že spadá do třídy A podle EN 55022, spadá automaticky do třídy B podle EN 55022. Pro zařízení zařazená do třídy A (ochranné pásmo 30m) podle EN 55022 platí následující. Dojde−li k rušení telekomunikačních nebo jinych zařízení, je uživatel povinen provést taková opatření, aby rušení odstranil.

VCCI Notice (Japan Only)

Most Dell computer systems are classified by the Voluntary Control Council for Interference (VCCI) as Class B information technology equipment (ITE). However, the inclusion of certain options can change the rating of some configurations to Class A. ITE, including peripherals, expansion cards, printers, input/output (I/O) devices, monitors, and so on, integrated into or connected to the system should match the electromagnetic environment classification (Class A or B) of the computer system.

To determine which classification applies to your computer system, examine the regulatory labels/markings (see "VCCI Class A ITE Regulatory Mark" and "VCCI Class B ITE Regulatory Mark") located on the bottom, side, or back panel of your computer. Once you have determined your system's VCCI classification, read the appropriate VCCI notice.

Class A ITE

この装置は、情報処理装置等電波障害自主規制協議会(VCCI)の基準に基づくクラス A 情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

This is a Class A product based on the standard of the Voluntary Control Council for Interference (VCCI) for information technology equipment. If this equipment is used in a domestic environment, radio disturbance may arise. When such trouble occurs, the user may be required to take corrective actions.

VCCI Class A ITE Regulatory Mark

If the regulatory label includes the following marking, your computer is a Class A product:

VCCI

Class B ITE

この装置は、情報処理装置等電波障害自主規制協議会(VCCI)の
基準に基づくクラス B 情報技術装置です。この装置は家庭環境で
使用することを目的としていますが、ラジオやテレビジョン受信機
に近接して使用されると、受信障害を引き起こすことがあります。
取扱説明書に従って正しい取り扱いをしてください。

This is a Class B product based on the standard of the Voluntary Control Council for Interference (VCCI) for information technology equipment. If this equipment is used near a radio or television receiver in a domestic environment, it may cause radio interference. Install and use the equipment according to the instruction manual.

VCCI Class B ITE Regulatory Mark

If the regulatory label includes the following marking, your computer is a Class B product:

MIC Notice (Republic of Korea Only)

To determine which classification (Class A or B) applies to your computer (or other Dell digital device), examine the Republic of Korean Ministry of Information and Communications (MIC) registration labels located on your computer (or other Dell digital device). The MIC label may be located separately from the other regulatory marking applied to your product. Line two of the label identifies the emissions class for the product—"(A)" for Class A products or "(B)" for Class B products.

NOTE: MIC emissions requirements provide for two classifications:

- Class A devices are for business purposes.
- Class B devices are for nonbusiness purposes.

Class A Device

기 종 별	사 용 자 안 내 문
A급 기기 (업무용 정보통신기기)	이 기기는 업무용으로 전자파적합등록을 한 기기이오니 판매자 또는 사용자는 이 점을 주의하시기 바라며 만약 잘못 판매 또는 구입하였을 때에는 가정용으로 교환하시기 바랍니다.

Please note that this device has been approved for business purposes with regard to electromagnetic interference. If you find that this device is not suitable for your use, you may exchange it for a nonbusiness-purpose device.

MIC Class A Regulatory Label

If the regulatory label includes the following marking, your computer is a Class A product:

MIC

1. 기기의 명칭(모델명):
2. 인증번호:(A)
3. 인증받은 자의 상호:
4. 제조년월일:
5. 제조자/제조국가:

Class B Device

기종별	사용자 안내문
B급 기기 (가정용 정보통신기기)	이 기기는 가정용으로 전자파적합등록을 한 기기로서 주거지역에서는 물론 모든 지역에서 사용할 수 있습니다.

Please note that this device has been approved for nonbusiness purposes and may be used in any environment, including residential areas.

MIC Class B Regulatory Label

If the regulatory label includes the following marking, your computer is a Class B product.

1. 기기의 명칭(모델명):
2. 인증번호:(B)
3. 인증받은 자의 상호:
4. 제조년월일:
5. 제조자/제조국가:

Polish Center for Testing and Certification Notice

The equipment should draw power from a socket with an attached protection circuit (a 3-prong socket). All equipment that works together (computer, monitor, printer, and so on) should have the same power supply source.

The phasing conductor of the room's electrical installation should have a reserve short-circuit protection device in the form of a fuse with a nominal value no larger than 16 amperes (A).

To completely switch off the equipment, the power supply cable must be removed from the power supply socket, which should be located near the equipment and easily accessible.

A protection mark "B" confirms that the equipment is in compliance with the protection usage requirements of standards PN-93/T-42107 and PN-EN 55022: 1996.

Wymagania Polskiego Centrum Badań i Certyfikacji

Urządzenie powinno być zasilane z gniazda z przyłączonym obwodem ochronnym (gniazdo z kołkiem). Współpracujące ze sobą urządzenia (komputer, monitor, drukarka) powinny być zasilane z tego samego źródła.

Instalacja elektryczna pomieszczenia powinna zawierać w przewodzie fazowym rezerwową ochronę przed zwarciami, w postaci bezpiecznika o wartości znamionowej nie większej niż 16A (amperów).

W celu całkowitego wyłączenia urządzenia z sieci zasilania, należy wyjąć wtyczkę kabla zasilającego z gniazdka, które powinno znajdować się w pobliżu urządzenia i być łatwo dostępne.
Znak bezpieczeństwa "B" potwierdza zgodność urządzenia z wymaganiami bezpieczeństwa użytkowania zawartymi w PN−93/T−42107 i PN−EN 55022:1996.

Jeżeli na tabliczce znamionowej umieszczono informację, że urządzenie jest klasy A, to oznacza to, że urządzenie w środowisku mieszkalnym może powodować zaklócenia radioelektryczne. W takich przypadkach można żądać od jego użytkownika zastosowania odpowiednich úrodków zaradczych.

Pozostałe instrukcje bezpieczeństwa

- Nie należy używać wtyczek adapterowych lub usuwać kołka obwodu ochronnego z wtyczki. Jeżeli konieczne jest użycie przedłużacza to należy użyć przedłużacza 3−żyłowego z prawidłowo połączonym przewodem ochronnym.
- System komputerowy należy zabezpieczyć przed nagłymi, chwilowymi wzrostami lub spadkami napięcia, używając eliminatora przepięć, urządzenia dopasowującego lub bezzakłóceniowego źródła zasilania.
- Należy upewnić się, aby nic nie leżało na kablach systemu komputerowego, oraz aby kable nie były umieszczone w miejscu, gdzie można byłoby na nie nadeptywać lub potykać się o nie.
- Nie należy rozlewać napojów ani innych płynów na system komputerowy.
- Nie należy wpychać żadnych przedmiotów do otworów systemu komputerowego, gdyż może to spowodować pożar lub porażenie prądem, poprzez zwarcie elementów wewnętrznych.
- System komputerowy powinien znajdować się z dala od grzejników i źródeł ciepła. Ponadto, nie należy blokować otworów wentylacyjnych. Należy unikać kładzenia luźnych papierów pod komputer oraz umieszczania komputera w ciasnym miejscu bez możliwości cyrkulacji powietrza wokół niego.

BSMI Notice (Taiwan Only)

If you find a 檢磁**xxxxxxxx** or mark on the regulatory label on the bottom, side, or back panel of your computer, the following section is applicable:

BSMI 通告 (僅限於台灣)

大多數的 Dell 電腦系統被 BSMI (經濟部標準檢驗局) 劃分為乙類數位裝置。但是，使用某些選件會使有些組態的等級變成甲類。若要確定您的電腦系統適用等級，請檢查所有位於電腦底部或背面板、擴充卡安裝托架，以及擴充卡上的 BSMI 註冊標籤。如果其中有一甲類標籤，即表示您的系統為甲類數位裝置。如果只有 BSMI 的檢磁號碼標籤，則表示您的系統為乙類數位裝置。

一旦確定了系統的 BSMI 等級，請閱讀相關的 BSMI 通告。請注意，BSMI 通告規定凡是未經 Dell Computer Corporation 明確批准的擅自變更或修改，將導致您失去此設備的使用權。

此裝置符合 BSMI (經濟部標準檢驗局) 的規定，使用時須符合以下兩項條件：

- 此裝置不會產生有害干擾。
- 此裝置必須能接受所接收到的干擾，包括可能導致無法正常作業的干擾。

甲類

此設備經測試證明符合 BSMI (經濟部標準檢驗局) 之甲類數位裝置的限制規定。這些限制的目的是為了在商業環境中使用此設備時，能提供合理的保護以防止有害的干擾。此設備會產生、使用並散發射頻能量；如果未遵照製造廠商的指導手冊來安裝和使用，可能會干擾無線電通訊。請勿在住宅區使用此設備。

警告使用者:

這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求采取某些適當的對策。

乙類

此設備經測試證明符合 BSMI (經濟部標準檢驗局) 之乙類數位裝置的限制規定。這些限制的目的是為了在住宅區安裝時，能防止有害的干擾，提供合理的保護。此設備會產生、使用並散發射頻能量；如果未遵照製造廠商的指導手冊來安裝和使用，可能會干擾無線電通訊。但是，這並不保證在個別的安裝中不會產生干擾。您可以透過關閉和開啓此設備來判斷它是否會對廣播和電視收訊造成干擾；如果確實如此，我們建議您嘗試以下列一種或多種方法來排除干擾：

- 重新調整天線的接收方向或重新放置接收天線。
- 增加設備與接收器的距離。
- 將設備連接至不同的插座，使設備與接收器連接在不同的電路上。
- 請向經銷商或有經驗的無線電/電視技術人員查詢，以獲得幫助。

NOM Information (Mexico Only)

The following information is provided on the device(s) described in this document in compliance with the requirements of the official Mexican standards (NOM):

Exporter:	Dell Computer Corporation One Dell Way Round Rock, TX 78682
Importer:	Dell Computer de México, S.A. de C.V. Paseo de la Reforma 2620 - 11° Piso Col. Lomas Altas 11950 México, D.F.
Ship to:	Dell Computer de México, S.A. de C.V. al Cuidado de Kuehne & Nagel de México S. de R.I. Avenida Soles No. 55 Col. Peñon de los Baños 15520 México, D.F.
Model number:	WHL and WHM
Supply voltage:	115/230 VAC
Frequency:	60/50 Hz
Input current rating:	6.0/3.0 A

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SECTION 25

Warranty and Return Policy

Dell Computer Corporation ("Dell") manufactures its hardware products from parts and components that are new or equivalent to new in accordance with industry-standard practices. For information about the Dell warranty for your computer, see the *System Information Guide*.

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SECTION 26

Getting Help

Technical Assistance

If you need help with a technical problem, Dell is ready to assist you.

CAUTION: If you need to remove the computer covers, first disconnect the computer power and modem cables from all electrical outlets.

1 Complete the procedures in "Solving Problems."

2 Run the Dell Diagnostics.

3 Make a copy of the Diagnostics Checklist and fill it out.

4 Use Dell's extensive suite of online services available at Dell Support (**support.dell.com**) for help with installation and troubleshooting procedures.

5 If the preceding steps have not resolved the problem, contact Dell.

NOTE: Call technical support from a telephone near or at the computer so that technical support can assist you with any necessary procedures.

NOTE: Dell's Express Service Code system may not be available in all countries.

When prompted by Dell's automated telephone system, enter your Express Service Code to route the call directly to the proper support personnel. If you do not have an Express Service Code, open the **Dell Accessories** folder, double-click the **Express Service Code** icon, and follow the directions.

For instructions on using the technical support service, see "Technical Support Service."

NOTE: Some of the following services are not always available in all locations outside the continental U.S. Call your local Dell representative for information on availability.

Online Services

You can access Dell Support at **support.dell.com**. Select your region on the **WELCOME TO DELL SUPPORT** page, and fill in the requested details to access help tools and information.

You can contact Dell electronically using the following addresses:

- World Wide Web

  www.dell.com/

  www.dell.com/ap/ (Asian/Pacific countries only)

  www.euro.dell.com (Europe only)

  www.dell.com/la/ (Latin American countries)

www.dell.ca (Canada only)

- Anonymous file transfer protocol (FTP)

  ftp.dell.com/

  Log in as user: `anonymous`, and use your e-mail address as your password.

- Electronic Support Service

  mobile_support@us.dell.com

  support@us.dell.com

  apsupport@dell.com (Asian/Pacific countries only)

  support.euro.dell.com (Europe only)

- Electronic Quote Service

  sales@dell.com

  apmarketing@dell.com (Asian/Pacific countries only)

  sales_canada@dell.com (Canada only)

- Electronic Information Service

  info@dell.com

AutoTech Service

Dell's automated technical support service—AutoTech—provides recorded answers to the questions most frequently asked by Dell customers about their portable and desktop computers.

When you call AutoTech, use your touch-tone telephone to select the subjects that correspond to your questions.

The AutoTech service is available 24 hours a day, 7 days a week. You can also access this service through the technical support service. For the telephone number to call, see the contact numbers for your region.

Automated Order-Status Service

To check on the status of any Dell™ products that you have ordered, you can go to **support.dell.com**, or you can call the automated order-status service. A recording prompts you for the information needed to locate and report on your order. For the telephone number to call, see the contact numbers for your region.

Technical Support Service

Dell's technical support service is available 24 hours a day, 7 days a week, to answer your questions about Dell hardware. Our technical support staff uses computer-based diagnostics to provide fast, accurate answers.

To contact Dell's technical support service, see "" and then call the number for your country as listed in "Contacting Dell."

Problems With Your Order

If you have a problem with your order, such as missing parts, wrong parts, or incorrect billing, contact Dell for customer assistance. Have your invoice or packing slip handy when you call. For the telephone number to call, see the contact numbers for your region.

Product Information

If you need information about additional products available from Dell, or if you would like to place an order, visit the Dell website at **www.dell.com**. For the telephone number to call to speak to a sales specialist, see the contact numbers for your region.

Returning Items for Warranty Repair or Credit

Prepare all items being returned, whether for repair or credit, as follows:

1. Call Dell to obtain a Return Material Authorization Number, and write it clearly and prominently on the outside of the box.

   For the telephone number to call, see the contact numbers for your region.

2. Include a copy of the invoice and a letter describing the reason for the return.
3. Include a copy of the Diagnostics Checklist indicating the tests you have run and any error messages reported by the Dell Diagnostics.
4. Include any accessories that belong with the item(s) being returned (power cables, software floppy disks, guides, and so on) if the return is for credit.
5. Pack the equipment to be returned in the original (or equivalent) packing materials.

You are responsible for paying shipping expenses. You are also responsible for insuring any product returned, and you assume the risk of loss during shipment to Dell. Collect On Delivery (C.O.D.) packages are not accepted.

Returns that are missing any of the preceding requirements will be refused at Dell's receiving dock and returned to you.

Before You Call

NOTE: Have your Express Service Code ready when you call. The code helps Dell's automated-support telephone system direct your call more efficiently.

Remember to fill out the Diagnostics Checklist. If possible, turn on your computer before you call Dell for technical assistance and call from a telephone at or near the computer. You may be asked to type some commands at the keyboard, relay detailed information during operations, or try other troubleshooting steps possible only at the computer itself. Ensure that the computer documentation is available.

CAUTION: Before working inside your computer, read the safety instructions in your *System Information Guide*.

Diagnostics Checklist
Name:
Date:
Address:
Phone number:
Service Tag (bar code on the back of the computer):
Express Service Code:
Return Material Authorization Number (if provided by Dell support technician):
Operating system and version:
Devices:
Expansion cards:
Are you connected to a network? Yes No
Network, version, and network adapter:
Programs and versions:
See your operating system documentation to determine the contents of the system's start-up files. If the computer is connected to a printer, print each file. Otherwise, record the contents of each file before calling Dell.
Error message, beep code, or diagnostic code:
Description of problem and troubleshooting procedures you performed:

Contacting Dell

To contact Dell electronically, you can access the following websites:

- **www.dell.com**
- **support.dell.com** (technical support)
- **premiersupport.dell.com** (technical support for educational, government, healthcare, and medium/large business customers, including Premier, Platinum, and Gold customers)

For specific web addresses for your country, find the appropriate country section in the table below.

NOTE: Toll-free numbers are for use within the country for which they are listed.

When you need to contact Dell, use the electronic addresses, telephone numbers, and codes provided in the following table. If you need assistance in determining which codes to use, contact a local or an international operator.

Country (City) International Access Code Country Code City Code	Department Name or Service Area, Website and E-Mail Address	Area Codes, Local Numbers, and Toll-Free Numbers
Anguilla	General Support	toll-free: 800-335-0031
Antigua and Barbuda	General Support	1-800-805-5924
Argentina (Buenos Aires)	Website: **www.dell.com.ar**	
International Access Code: **00**	Tech Support and Customer Care	toll-free: 0-800-444-0733
Country Code: **54**	Sales	0-810-444-3355
City Code: **11**	Tech Support Fax	11 4515 7139
	Customer Care Fax	11 4515 7138
Aruba	General Support	toll-free: 800-1578

Country (City) International Access Code Country Code City Code	Department Name or Service Area, Website and E-Mail Address	Area Codes, Local Numbers, and Toll-Free Numbers
Australia (Sydney)	E-mail (Australia): au_tech_support@dell.com	
International Access Code: **0011**	E-mail (New Zealand): nz_tech_support@dell.com	
Country Code: **61**	Home and Small Business	1-300-65-55-33
City Code: **2**	Government and Business	toll-free: 1-800-633-559
	Preferred Accounts Division (PAD)	toll-free: 1-800-060-889
	Customer Care	toll-free: 1-800-819-339
	Corporate Sales	toll-free: 1-800-808-385
	Transaction Sales	toll-free: 1-800-808-312
	Fax	toll-free: 1-800-818-341
Austria (Vienna)	Website: **support.euro.dell.com**	
International Access Code: **900**	E-mail: tech_support_central_europe@dell.com	
Country Code: **43**	Home/Small Business Sales	0820 240 530 00
City Code: **1**	Home/Small Business Fax	0820 240 530 49
	Home/Small Business Customer Care	0820 240 530 14
	Preferred Accounts/Corporate Customer Care	0820 240 530 16
	Home/Small Business Technical Support	0820 240 530 14
	Preferred Accounts/Corporate Technical Support	0660 8779
	Switchboard	0820 240 530 00
Bahamas	General Support	toll-free: 1-866-278-6818
Barbados	General Support	1-800-534-3066
Belgium (Brussels)	Website: **support.euro.dell.com**	
International Access Code: **00**	E-mail: tech_be@dell.com	
Country Code: **32**	E-mail for French Speaking Customers: **support.euro.dell.com/be/fr/emaildell/**	
City Code: **2**	Technical Support	02 481 92 88
	Customer Care	02 481 91 19
	Corporate Sales	02 481 91 00
	Fax	02 481 92 99
	Switchboard	02 481 91 00
Bermuda	General Support	1-800-342-0671

Country (City) International Access Code Country Code City Code	Department Name or Service Area, Website and E-Mail Address	Area Codes, Local Numbers, and Toll-Free Numbers
Bolivia	General Support	toll-free: 800-10-0238
Brazil	Website: **www.dell.com/br**	
International Access Code: **00**	Customer Support, Technical Support	0800 90 3355
Country Code: **55**	Tech Support Fax	51 481 5470
City Code: **51**	Customer Care Fax	51 481 5480
	Sales	0800 90 3390
British Virgin Islands	General Support	toll-free: 1-866-278-6820
Brunei	Customer Technical Support (Penang, Malaysia)	604 633 4966
Country Code: **673**	Customer Service (Penang, Malaysia)	604 633 4949
	Transaction Sales (Penang, Malaysia)	604 633 4955
Canada (North York, Ontario)	Online Order Status: **www.dell.ca/ostatus**	
International Access Code: **011**	AutoTech (automated technical support)	toll-free: 1-800-247-9362
	TechFax	toll-free: 1-800-950-1329
	Customer Care (Home Sales/Small Business)	toll-free: 1-800-847-4096
	Customer Care (med./large business, government)	toll-free: 1-800-326-9463
	Technical Support (Home Sales/Small Business)	toll-free: 1-800-847-4096
	Technical Support (med./large bus., government)	toll-free: 1-800-387-5757
	Sales (Home Sales/Small Business)	toll-free: 1-800-387-5752
	Sales (med./large bus., government)	toll-free: 1-800-387-5755
	Spare Parts Sales & Extended Service Sales	1 866 440 3355
Cayman Islands	General Support	1-800-805-7541
Chile (Santiago)	Sales, Customer Support, and Technical Support	toll-free: 1230-020-4823
Country Code: **56**		
City Code: **2**		

Country (City) International Access Code Country Code City Code	Department Name or Service Area, Website and E-Mail Address	Area Codes, Local Numbers, and Toll-Free Numbers
China (Xiamen)	Tech Support website: **support.ap.dell.com/china**	
Country Code: **86**	Tech Support E-mail: cn_support@dell.com	
City Code: **592**	Tech Support Fax	818 1350
	Home and Small Business Technical Support	toll-free: 800 858 2437
	Corporate Accounts Technical Support	toll-free: 800 858 2333
	Customer Experience	toll-free: 800 858 2060
	Home and Small Business	toll-free: 800 858 2222
	Preferred Accounts Division	toll-free: 800 858 2062
	Large Corporate Accounts GCP	toll-free: 800 858 2055
	Large Corporate Accounts Key Accounts	toll-free: 800 858 2628
	Large Corporate Accounts North	toll-free: 800 858 2999
	Large Corporate Accounts North Government and Education	toll-free: 800 858 2955
	Large Corporate Accounts East	toll-free: 800 858 2020
	Large Corporate Accounts East Government and Education	toll-free: 800 858 2669
	Large Corporate Accounts Queue Team	toll-free: 800 858 2572
	Large Corporate Accounts South	toll-free: 800 858 2355
	Large Corporate Accounts West	toll-free: 800 858 2811
	Large Corporate Accounts Spare Parts	toll-free: 800 858 2621
Colombia	General Support	980-9-15-3978
Costa Rica	General Support	0800-012-0435
Czech Republic (Prague)	Website: **support.euro.dell.com**	
International Access Code: **00**	E-mail: czech_dell@dell.com	
Country Code: **420**	Technical Support	02 2186 27 27
City Code: **2**	Customer Care	02 2186 27 11
	Fax	02 2186 27 14
	TechFax	02 2186 27 28
	Switchboard	02 2186 27 11

Country (City) International Access Code Country Code City Code	Department Name or Service Area, Website and E-Mail Address	Area Codes, Local Numbers, and Toll-Free Numbers
Denmark (Copenhagen)	Website: **support.euro.dell.com**	
International Access Code: **00**	E-mail Support (portable computers): den_nbk_support@dell.com	
Country Code: **45**	E-mail Support (desktop computers): den_support@dell.com	
	E-mail Support (servers): Nordic_server_support@dell.com	
	Technical Support	7023 0182
	Customer Care (Relational)	7023 0184
	Home/Small Business Customer Care	3287 5505
	Switchboard (Relational)	3287 1200
	Fax Switchboard (Relational)	3287 1201
	Switchboard (Home/Small Business)	3287 5000
	Fax Switchboard (Home/Small Business)	3287 5001
Dominica	General Support	toll-free: 1-866-278-6821
Dominican Republic	General Support	1-800-148-0530
Ecuador	General Support	toll-free: 999-119
El Salvador	General Support	01-899-753-0777
Finland (Helsinki)	Website: **support.euro.dell.com**	
International Access Code: **990**	E-mail: fin_support@dell.com	
Country Code: **358**	E-mail Support (servers): Nordic_support@dell.com	
City Code: **9**	Technical Support	09 253 313 60
	Technical Support Fax	09 253 313 81
	Relational Customer Care	09 253 313 38
	Home/Small Business Customer Care	09 693 791 94
	Fax	09 253 313 99
	Switchboard	09 253 313 00

Country (City) International Access Code Country Code City Code	Department Name or Service Area, Website and E-Mail Address	Area Codes, Local Numbers, and Toll-Free Numbers
France (Paris) (Montpellier)	Website: **support.euro.dell.com**	
International Access Code: **00**	E-mail: **support.euro.dell.com/fr/fr/emaildell/**	
Country Code: **33**	**Home and Small Business**	
City Codes: **(1) (4)**	Technical Support	0825 387 270
	Customer Care	0825 823 833
	Switchboard	0825 004 700
	Switchboard (calls from outside of France)	04 99 75 40 00
	Sales	0825 004 700
	Fax	0825 004 701
	Fax (calls from outside of France)	04 99 75 40 01
	Corporate	
	Technical Support	0825 004 719
	Customer Care	0825 338 339
	Switchboard	01 55 94 71 00
	Sales	01 55 94 71 00
	Fax	01 55 94 71 01
Germany (Langen)	Website: **support.euro.dell.com**	
International Access Code: **00**	E-mail: tech_support_central_europe@dell.com	
Country Code: **49**	Technical Support	06103 766-7200
City Code: **6103**	Home/Small Business Customer Care	0180-5-224400
	Global Segment Customer Care	06103 766-9570
	Preferred Accounts Customer Care	06103 766-9420
	Large Accounts Customer Care	06103 766-9560
	Public Accounts Customer Care	06103 766-9555
	Switchboard	06103 766-7000

Country (City) International Access Code Country Code City Code	Department Name or Service Area, Website and E-Mail Address	Area Codes, Local Numbers, and Toll-Free Numbers
Greece	Website: **support.euro.dell.com**	
International Access Code: 00	E-mail: support.euro.dell.com/gr/en/emaildell/	
Country Code: 30	Technical Support	080044149518
	Gold Technical Support	08844140083
	Switchboard	2108129800
	Sales	2108129800
	Fax	2108129812
Grenada	General Support	toll-free: 1-866-540-3355
Guatemala	General Support	1-800-999-0136
Guyana	General Support	toll-free: 1-877-270-4609
Hong Kong	Website: **support.ap.dell.com**	
International Access Code: **001**	E-mail: ap_support@dell.com	
Country Code: **852**	Technical Support (Dimension™ and Inspiron™)	296 93188
	Technical Support (OptiPlex™, Latitude™, and Dell Precision™)	296 93191
	Customer Service (non-technical, post-sales issues)	800 93 8291
	Transaction Sales	toll-free: 800 96 4109
	Large Corporate Accounts HK	toll-free: 800 96 4108
	Large Corporate Accounts GCP HK	toll-free: 800 90 3708
India	Technical Support	1600 33 8045
	Sales	1600 33 8044

Country (City) International Access Code Country Code City Code	Department Name or Service Area, Website and E-Mail Address	Area Codes, Local Numbers, and Toll-Free Numbers
Ireland (Cherrywood)	Website: **support.euro.dell.com**	
International Access Code: **16**	E-mail: dell_direct_support@dell.com	
Country Code: **353**	Ireland Technical Support	1850 543 543
City Code: **1**	U.K. Technical Support (dial within U.K. only)	0870 908 0800
	Home User Customer Care	01 204 4014
	Small Business Customer Care	01 204 4014
	U.K. Customer Care (dial within U.K. only)	0870 906 0010
	Corporate Customer Care	1850 200 982
	Corporate Customer Care(dial within U.K. only)	0870 907 4499
	Ireland Sales	01 204 4444
	U.K. Sales (dial within U.K. only)	0870 907 4000
	Fax/SalesFax	01 204 0103
	Switchboard	01 204 4444
Italy (Milan)	Website: **support.euro.dell.com**	
International Access Code: **00**	E-mail: **support.euro.dell.com/it/it/emaildell/**	
Country Code: **39**	**Home and Small Business**	
City Code: **02**	Technical Support	02 577 826 90
	Customer Care	02 696 821 14
	Fax	02 696 821 13
	Switchboard	02 696 821 12
	Corporate	
	Technical Support	02 577 826 90
	Customer Care	02 577 825 55
	Fax	02 575 035 30
	Switchboard	02 577 821
Jamaica	General Support (dial from within Jamaica only)	1-800-682-3639

Country (City) International Access Code Country Code City Code	Department Name or Service Area, Website and E-Mail Address	Area Codes, Local Numbers, and Toll-Free Numbers
Japan (Kawasaki)	Website: **support.jp.dell.com**	
International Access Code: **001**	Technical Support (servers)	toll-free: 0120-198-498
Country Code: **81**	Technical Support outside of Japan (servers)	81-44-556-4162
City Code: **44**	Technical Support (Dimension™ and Inspiron™)	toll-free: 0120-198-226
	Technical Support outside of Japan (Dimension and Inspiron)	81-44-520-1435
	Technical Support (Dell Precision™, OptiPlex™, and Latitude™)	toll-free:0120-198-433
	Technical Support outside of Japan (Dell Precision, OptiPlex, and Latitude)	81-44-556-3894
	Faxbox Service	044-556-3490
	24-Hour Automated Order Service	044-556-3801
	Customer Care	044-556-4240
	Business Sales Division (up to 400 employees)	044-556-1465
	Preferred Accounts Division Sales (over 400 employees)	044-556-3433
	Large Corporate Accounts Sales (over 3500 employees)	044-556-3430
	Public Sales (government agencies, educational institutions, and medical institutions)	044-556-1469
	Global Segment Japan	044-556-3469
	Individual User	044-556-1760
	Switchboard	044-556-4300
Korea (Seoul)	Technical Support	toll-free: 080-200-3800
International Access Code: **001**	Sales	toll-free: 080-200-3600
Country Code: **82**	Customer Service (Seoul, Korea)	toll-free: 080-200-3800
City Code: **2**	Customer Service (Penang, Malaysia)	604 633 4949
	Fax	2194-6202
	Switchboard	2194-6000

Country (City) International Access Code Country Code City Code	Department Name or Service Area, Website and E-Mail Address	Area Codes, Local Numbers, and Toll-Free Numbers
Latin America	Customer Technical Support (Austin, Texas, U.S.A.)	512 728-4093
	Customer Service (Austin, Texas, U.S.A.)	512 728-3619
	Fax (Technical Support and Customer Service) (Austin, Texas, U.S.A.)	512 728-3883
	Sales (Austin, Texas, U.S.A.)	512 728-4397
	SalesFax (Austin, Texas, U.S.A.)	512 728-4600
		or 512 728-3772
Luxembourg	Website: **support.euro.dell.com**	
International Access Code: **00**	E-mail: tech_be@dell.com	
Country Code: **352**	Technical Support (Brussels, Belgium)	3420808075
	Home/Small Business Sales (Brussels, Belgium)	toll-free: 080016884
	Corporate Sales (Brussels, Belgium)	02 481 91 00
	Customer Care (Brussels, Belgium)	02 481 91 19
	Fax (Brussels, Belgium)	02 481 92 99
	Switchboard (Brussels, Belgium)	02 481 91 00
Macao	Technical Support	toll-free: 0800 582
Country Code: **853**	Customer Service (Penang, Malaysia)	604 633 4949
	Transaction Sales	toll-free: 0800 581
Malaysia (Penang)	Technical Support	toll-free: 1 800 888 298
International Access Code: **00**	Customer Service	04 633 4949
Country Code: **60**	Transaction Sales	toll-free: 1 800 888 202
City Code: **4**	Corporate Sales	toll-free: 1 800 888 213

Country (City) International Access Code Country Code City Code	Department Name or Service Area, Website and E-Mail Address	Area Codes, Local Numbers, and Toll-Free Numbers
Mexico	Customer Technical Support	001-877-384-8979
International Access Code: **00**		or 001-877-269-3383
Country Code: **52**	Sales	50-81-8800
		or 01-800-888-3355
	Customer Service	001-877-384-8979
		or 001-877-269-3383
	Main	50-81-8800
		or 01-800-888-3355
Montserrat	General Support	toll-free: 1-866-278-6822
Netherlands Antilles	General Support	001-800-882-1519
Netherlands (Amsterdam)	Website: **support.euro.dell.com**	
International Access Code: **00**	E-mail (Technical Support):	
Country Code: **31**	(Enterprise): nl_server_support@dell.com	
City Code: **20**	(Latitude): nl_latitude_support@dell.com	
	(Inspiron): nl_inspiron_support@dell.com	
	(Dimension): nl_dimension_support@dell.com	
	(OptiPlex): nl_optiplex_support@dell.com	
	(Dell Precision): nl_workstation_support@dell.com	
	Technical Support	020 674 45 00
	Technical Support Fax	020 674 47 66
	Home/Small Business Customer Care	020 674 42 00
	Relational Customer Care	020 674 4325
	Home/Small Business Sales	020 674 55 00
	Relational Sales	020 674 50 00
	Home/Small Business Sales Fax	020 674 47 75
	Relational Sales Fax	020 674 47 50
	Switchboard	020 674 50 00
	Switchboard Fax	020 674 47 50

Country (City) International Access Code Country Code City Code	Department Name or Service Area, Website and E-Mail Address	Area Codes, Local Numbers, and Toll-Free Numbers
New Zealand	E-mail (New Zealand): nz_tech_support@dell.com	
International Access Code: **00**	E-mail (Australia): au_tech_support@dell.com	
Country Code: **64**	Home and Small Business	0800 446 255
	Government and Business	0800 444 617
	Sales	0800 441 567
	Fax	0800 441 566
Nicaragua	General Support	001-800-220-1006
Norway (Lysaker)	Website: **support.euro.dell.com**	
International Access Code: **00**	E-mail Support (portable computers):	
Country Code: **47**	nor_nbk_support@dell.com	
	E-mail Support (desktop computers):	
	nor_support@dell.com	
	E-mail Support (servers):	
	nordic_server_support@dell.com	
	Technical Support	671 16882
	Relational Customer Care	671 17514
	Home/Small Business Customer Care	23162298
	Switchboard	671 16800
	Fax Switchboard	671 16865
Panama	General Support	001-800-507-0962
Peru	General Support	0800-50-669
Poland (Warsaw)	Website: **support.euro.dell.com**	
International Access Code: **011**	E-mail: pl_support@dell.com	
Country Code: **48**	Customer Service Phone	57 95 700
City Code: **22**	Customer Care	57 95 999
	Sales	57 95 999
	Customer Service Fax	57 95 806
	Reception Desk Fax	57 95 998
	Switchboard	57 95 999

Country (City) International Access Code Country Code City Code	Department Name or Service Area, Website and E-Mail Address	Area Codes, Local Numbers, and Toll-Free Numbers
Portugal	Website: **support.euro.dell.com**	
International Access Code: **00**	E-mail: **support.euro.dell.com/pt/en/emaildell/**	
Country Code: **351**	Technical Support	707200149
	Customer Care	800 300 413
	Sales	800 300 410 or 800 300 411 or 800 300 412 or 21 422 07 10
	Fax	21 424 01 12
Puerto Rico	General Support	1-800-805-7545
St. Kitts and Nevis	General Support	toll-free: 1-877-441-4731
St. Lucia	General Support	1-800-882-1521
St. Vincent and the Grenadines	General Support	toll-free: 1-877-270-4609
Singapore (Singapore)	Technical Support	toll-free: 800 6011 051
International Access Code: **005**	Customer Service (Penang, Malaysia)	604 633 4949
Country Code: **65**	Transaction Sales	toll-free: 800 6011 054
	Corporate Sales	toll-free: 800 6011 053
South Africa (Johannesburg)	Website: **support.euro.dell.com**	
International Access Code:	E-mail: dell_za_support@dell.com	
09/091	Technical Support	011 709 7710
Country Code: **27**	Customer Care	011 709 7707
City Code: **11**	Sales	011 709 7700
	Fax	011 706 0495
	Switchboard	011 709 7700
Southeast Asian and Pacific Countries	Customer Technical Support, Customer Service, and Sales (Penang, Malaysia)	604 633 4810

Country (City) International Access Code Country Code City Code	Department Name or Service Area, Website and E-Mail Address	Area Codes, Local Numbers, and Toll-Free Numbers
Spain (Madrid)	Website: **support.euro.dell.com**	
International Access Code: **00**	E-mail: **support.euro.dell.com/es/es/emaildell/**	
Country Code: **34**	**Home and Small Business**	
City Code: **91**	Technical Support	902 100 130
	Customer Care	902 118 540
	Sales	902 118 541
	Switchboard	902 118 541
	Fax	902 118 539
	Corporate	
	Technical Support	902 100 130
	Customer Care	902 118 546
	Switchboard	91 722 92 00
	Fax	91 722 95 83
Sweden (Upplands Vasby)	Website: **support.euro.dell.com**	
International Access Code: **00**	E-mail: swe_support@dell.com	
Country Code: **46**	E-mail Support for Latitude and Inspiron: Swe-nbk_kats@dell.com	
City Code: **8**	E-mail Support for OptiPlex: Swe_kats@dell.com	
	E-mail Support for Servers: Nordic_server_support@dell.com	
	Technical Support	08 590 05 199
	Relational Customer Care	08 590 05 642
	Home/Small Business Customer Care	08 587 70 527
	Employee Purchase Program (EPP) Support	20 140 14 44
	Fax Technical Support	08 590 05 594
	Sales	08 590 05 185

Country (City) International Access Code Country Code City Code	Department Name or Service Area, Website and E-Mail Address	Area Codes, Local Numbers, and Toll-Free Numbers
Switzerland (Geneva)	Website: **support.euro.dell.com**	
International Access Code: **00**	E-mail: swisstech@dell.com	
Country Code: **41**	E-mail for French-speaking HSB and Corporate Customers: **support.euro.dell.com/ch/fr/emaildell/**	
City Code: **22**	Technical Support (Home and Small Business)	0844 811 411
	Technical Support (Corporate)	0844 822 844
	Customer Care (Home and Small Business)	0848 802 202
	Customer Care (Corporate)	0848 821 721
	Fax	022 799 01 90
	Switchboard	022 799 01 01
Taiwan	Technical Support (portable and desktop computers)	toll-free: 00801 86 1011
International Access Code: **002**	Technical Support (servers)	toll-free: 0080 60 1256
Country Code: **886**	Transaction Sales	toll-free: 0080 651 228
		or 0800 33 556
	Corporate Sales	toll-free: 0080 651 227
		or 0800 33 555
Thailand	Technical Support	toll-free: 0880 060 07
International Access Code: **001**	Customer Service (Penang, Malaysia)	604 633 4949
Country Code: **66**	Sales	toll-free: 0880 060 09
Trinidad/Tobago	General Support	1-800-805-8035
Turks and Caicos Islands	General Support	toll-free: 1-866-540-3355

Country (City) International Access Code Country Code City Code	Department Name or Service Area, Website and E-Mail Address	Area Codes, Local Numbers, and Toll-Free Numbers
U.K. (Bracknell)	Website: **support.euro.dell.com**	
International Access Code: **00**	Customer Care website: **support.euro.dell.com/uk/en/ECare/Form/Home.asp**	
Country Code: **44**		
City Code: **1344**	E-mail: dell_direct_support@dell.com	
	Technical Support (Corporate/Preferred Accounts/PAD [1000+ employees])	0870 908 0500
	Technical Support (direct/PAD and general)	0870 908 0800
	Global Accounts Customer Care	01344 373 186
	Home and Small Business Customer Care	0870 906 0010
	Corporate Customer Care	01344 373 185
	Preferred Accounts (500–5000 employees) Customer Care	0870 906 0010
	Central Government Customer Care	01344 373 193
	Local Government & Education Customer Care	01344 373 199
	Health Customer Care	01344 373 194
	Home and Small Business Sales	0870 907 4000
	Corporate/Public Sector Sales	01344 860 456
Uruguay	General Support	toll-free: 000-413-598-2521

Country (City) International Access Code Country Code City Code	Department Name or Service Area, Website and E-Mail Address	Area Codes, Local Numbers, and Toll-Free Numbers
U.S.A. (Austin, Texas)	Automated Order-Status Service	toll-free: 1-800-433-9014
International Access Code: **011**	AutoTech (portable and desktop computers)	toll-free: 1-800-247-9362
Country Code: **1**	**Consumer** (Home and Home Office)	
	Technical Support	toll-free: 1-800-624-9896
	Customer Service	toll-free: 1-800-624-9897
	DellNet™ Service and Support	toll-free: 1-877-Dellnet (1-877-335-5638)
	Employee Purchase Program (EPP) Customers	toll-free: 1-800-695-8133
	Financial Services website: **www.dellfinancialservices.com**	
	Financial Services (lease/loans)	toll-free: 1-877-577-3355
	Financial Services (Dell Preferred Accounts [DPA])	toll-free: 1-800-283-2210
	Business	
	Customer Service and Technical Support	toll-free: 1-800-822-8965
	Employee Purchase Program (EPP) Customers	toll-free: 1-800-695-8133
	Projectors Technical Support	toll-free: 1-877-459-7298
	Public (government, education, and healthcare)	
	Customer Service and Technical Support	toll-free: 1-800-456-3355
	Employee Purchase Program (EPP) Customers	toll-free: 1-800-234-1490
	Dell Sales	toll-free: 1-800-289-3355 or toll-free: 1-800-879-3355
	Dell Outlet Store (Dell refurbished computers)	toll-free: 1-888-798-7561
	Software and Peripherals Sales	toll-free: 1-800-671-3355
	Spare Parts Sales	toll-free: 1-800-357-3355
	Extended Service and Warranty Sales	toll-free: 1-800-247-4618
	Fax	toll-free: 1-800-727-8320
	Dell Services for the Deaf, Hard-of-Hearing, or Speech-Impaired	toll-free: 1-877-DELLTTY (1-877-335-5889)
U.S. Virgin Islands	General Support	1-877-673-3355
Venezuela	General Support	8001-3605

Glossary

A

AC — alternating current — The form of electricity that powers your computer when you plug the AC adapter power cable into an electrical outlet.

ACPI — advanced configuration and power interface — A power management specification that enables Microsoft® Windows® operating systems to put a computer in standby or hibernate mode to conserve the amount of electrical power allocated to each device attached to the computer.

AGP — accelerated graphics port — A dedicated graphics port that allows system memory to be used for video-related tasks. AGP delivers a smooth, true-color video image because of the faster interface between the video circuitry and the computer memory.

ANTIVIRUS SOFTWARE — A program designed to identify, quarantine, and/or delete viruses from your computer.

ASF — alert standards format — A standard to define a mechanism for reporting hardware and software alerts to a management console. ASF is designed to be platform- and operating system-independent.

B

BACKUP — A copy of a program or data file on a floppy disk, CD, or hard drive. As a precaution, back up the data files from your hard drive regularly.

BIOS — basic input/output system — A program (or utility) that serves as an interface between the computer hardware and the operating system. Unless you understand what effect the settings have on the computer, do not change the settings for this program. Also referred to as the system setup program.

BIT — The smallest unit of data interpreted by your computer.

BOOT SEQUENCE — Specifies the order of the devices from which the computer attempts to boot.

BOOTABLE CD — A CD that you can use to start your computer. In case your hard drive is damaged or your computer has a virus, ensure that you always have a bootable CD or bootable disk available. Your *Drivers and Utilities* CD is a bootable CD.

BOOTABLE DISK — A disk that you can use to start your computer. In case your hard drive is damaged or your computer has a virus, ensure that you always have a bootable disk or bootable CD available.

BPS — bits per second — The standard unit for measuring data transmission

speed.

BTU — British thermal unit — A measurement of heat output.

BUS — A communication pathway between the components in your computer.

BUS SPEED — The speed, given in MHz, that indicates how fast a bus can transfer information.

BYTE — The basic data unit used by your computer. A byte is usually equal to 8 bits.

C

C — Celsius — A temperature measurement system where 0° is the freezing point and 100° is the boiling point of water.

CACHE — A special high-speed storage mechanism which can be either a reserved section of main memory or an independent high-speed storage device. The cache enhances the efficiency of many microprocessor operations.

L1 cache — Primary cache stored inside the microprocessor.

L2 cache — Secondary cache which can either be external to the microprocessor or incorporated into the microprocessor architecture.

CD — compact disc — An optical form of storage media, typically used for audio and software programs.

CD DRIVE — A drive that uses optical technology to read data from CDs.

CD PLAYER — The software used to play music CDs. The CD player displays a window with buttons you use to play a CD.

CD-R — CD recordable — A recordable version of a CD. Data can be recorded only once onto a CD-R. Once recorded, the data cannot be erased or written over.

CD-RW — CD rewritable — A rewritable version of a CD. Data can be written to a CD-RW, and then erased and written over (rewritten).

CD-RW DRIVE — A drive that can read CDs and write to CD-RW (rewritable CDs) and CD-R (recordable CDs) discs. You can write to CD-RW discs multiple times, but you can write to CD-R discs only once.

CLOCK SPEED — The speed, given in MHz, that indicates how fast computer components that are connected to the system bus operate.

COA — Certificate of Authenticity — The Windows alpha-numeric code located on a sticker on your computer. You may need the COA to complete the operating system setup or reinstallation. Also referred to as the Product Key or Product ID.

CONTROL PANEL — A Windows utility that allows you to modify operating system and hardware settings, such as display settings.

CONTROLLER — A chip that controls the transfer of data between the microprocessor and memory or between the microprocessor and devices.

CRIMM — continuity rambus in-line memory module — A special module that has no memory chips and is used to fill unused RIMM slots.

Cursor — The marker on a display or screen that shows where the next keyboard or mouse action will occur. It often is a blinking solid line, an underline character, or a small arrow.

D

DDR SDRAM — double-data-rate SDRAM — A type of SDRAM that doubles the data burst cycle, improving system performance.

Device — Hardware such as a disk drive, printer, or keyboard that is installed in or connected to your computer.

Device driver — See driver.

DIN connector — A round, six-pin connector that conforms to DIN (Deutsche Industrinorm) standards; it is typically used to connect PS/2 keyboard or mouse cable connectors.

Disk striping — A technique for spreading data over multiple disk drives. Disk striping can speed up operations that retrieve data from disk storage. Computers that use disk striping generally allow the user to select the data unit size or stripe width.

DMA — direct memory access — A channel that allows certain types of data transfer between RAM and a device to bypass the microprocessor.

DMTF — Distributed Management Task Force — A consortium of hardware and software companies who develop management standards for distributed desktop, network, enterprise and Internet environments.

DRAM — dynamic random-access memory — Memory that stores information in integrated circuits containing capacitors.

Driver — Software that allows the operating system to control a device such as a printer. Many devices do not work properly if the correct driver is not installed in the computer.

DSL — Digital Subscriber Line — A technology that provides a constant, high-speed Internet connection through an analog telephone line.

Dual display mode — A display setting that allows you to use a second monitor as an extension of your display. Also referred to as extended display mode.

DVD — digital versatile disc — A disc usually used to store movies. DVDs are double-sided, whereas CDs are single-sided. DVD drives read most CD media as well.

DVD drive — A drive that uses optical technology to read data from DVDs and CDs.

DVD PLAYER — The software used to watch DVD movies. The DVD player displays a window with buttons that you use to watch a movie.

DVD+RW DRIVE — A drive that can read DVDs and most CD media and write to DVD+RW (rewritable DVDs) discs.

DVI — digital video interface — A standard for digital transmission between a computer and a digital video display; the DVI adapter works through the computer's integrated graphics.

E

ECC — error checking and correction — A type of memory that includes special circuitry for testing the accuracy of data as it passes in and out of memory.

ECP — extended capabilities port — A parallel connector design that provides improved bidirectional data transmission. Similar to EPP, it uses direct memory access to transfer data and often improves performance.

EIDE — enhanced integrated device electronics — An improved version of the IDE interface for hard drives and CD drives.

EMI — electromagnetic interference — Electrical interference caused by electromagnetic radiation.

ENERGY STAR® — EPA requirements that decrease the overall consumption of electricity.

EPP — enhanced parallel port — A parallel connector design that provides bidirectional data transmission.

ESD — electrostatic discharge — A rapid discharge of static electricity. ESD can damage integrated circuits found in computer and communications equipment.

EXPANSION CARD — A circuit board that installs in an expansion slot on the computer's system board, expanding the capabilities of the computer. Examples include video, modem, and sound cards.

EXPANSION SLOT — A connector on the computer's system board where you insert an expansion card, connecting it to the system bus.

EXPRESS SERVICE CODE — A numeric code located on a sticker on your Dell™ computer. Use the Express Service Code when contacting Dell for assistance.

EXTENDED DISPLAY MODE — A display setting that allows you to use a second monitor as an extension of your display. Also referred to as dual display mode.

EXTENDED PC CARD — A PC card that extends beyond the edge of the PC card slot when installed.

F

F — Fahrenheit — A temperature measurement system where 32° is the freezing point and 212° is the boiling point of water.

FCC — Federal Communications Commission — A U.S. agency responsible for enforcing communications-related regulations that state how much radiation computers and other electronic equipment can emit.

Floppy drive — A disk drive that can read and write to floppy disks.

Folder — A place to organize and group files on a disk or drive. Files in a folder can be viewed and ordered in various ways, such as alphabetically, by date, and by size.

Format — The process that prepares a drive or disk for file storage. When a drive or disk is formatted, the existing information on it is lost.

FSB — front side bus — The data path and physical interface between the microprocessor and RAM.

FTP — file transfer protocol — A standard Internet protocol used to exchange files between computers connected to the Internet.

G

G — gravity — A measurement of weight and force.

GB — gigabyte — For memory, a gigabyte is a unit of data that equals 1024 MB (1,073,741,824 bytes); for storage, a gigabyte equals 16 Mb, or 1 billion bytes.

GHz — gigahertz — A measurement of frequency that equals one thousand million Hz, or one thousand MHz.

Graphics mode — A video mode that can be defined as *x* horizontal pixels by *y* vertical pixels by *z* colors. Graphics modes can display an unlimited variety of shapes and fonts.

GUI — graphical user interface — Software that interacts with the user by means of menus, windows, and icons. Most programs that operate on the Microsoft Windows operating systems are GUIs.

H

Hard drive — A drive that reads and writes data on a hard disk. The terms hard drive and hard disk are often used interchangeably.

Heat sink — A metal plate on some microprocessors that helps dissipate heat.

Hibernate mode — A power management mode that saves everything in memory to a reserved space on the hard drive and then turns off the computer.

When you restart the computer, the memory information that was saved to the hard drive is automatically restored.

HTML — hypertext markup language — A set of codes inserted into an Internet web page intended for display on an Internet browser.

HTTP — hypertext transfer protocol — A protocol for exchanging files between computers connected to the Internet.

Hz — hertz — A unit of frequency measurement that equals 1 cycle per second. Computers and electronic devices are often measured in kilohertz (kHz), megahertz (MHz), gigahertz (GHz), or terahertz (THz).

I

IC — Industry Canada — The Canadian regulatory body responsible for regulating emissions from electronic equipment, much as the FCC does in the United States.

IDE — integrated device electronics — An interface for mass storage devices in which the controller is integrated into the hard drive or CD drive.

IEEE 1394 — Institute of Electrical and Electronics Engineers, Inc. — A high-performance serial bus used to connect IEEE 1394-compatible devices, such as digital cameras and DVD players, to the computer.

Integrated — Usually refers to components that are physically located on the computer's system board. Also referred to as built-in.

I/O — input/output — An operation or device that enters and extracts data from your computer. Keyboards and printers are I/O devices.

I/O address — An address in RAM that is associated with a specific device (such as a serial connector, parallel connector, or expansion slot) and allows the microprocessor to communicate with that device.

IRQ — interrupt request — An electronic pathway assigned to a specific device so that the device can communicate with the microprocessor. Each device connection must be assigned an IRQ. Although two devices can share the same IRQ assignment, you cannot operate both devices simultaneously.

ISP — Internet service provider — A company that allows you to access its host server to connect directly to the Internet, send and receive e-mail, and access websites. The ISP typically provides you with a software package, user name, and access phone numbers for a fee.

K

Kb — kilobit — A unit of data that equals 1024 bytes. A measurement of the capacity of memory integrated circuits.

KB — kilobyte — A unit of data that equals 1024 bits but is often referred to as

1000 bytes.

kHz — kilohertz — A measurement of frequency that equals 1000 Hz.

L

LAN — local area network — A computer network covering a small area. A LAN usually is confined to a building or a few nearby buildings. A LAN can be connected to another LAN over any distance via telephone lines and radio waves to form a wide area network (WAN).

LED — light-emitting diode — An electronic component that emits light to indicate the status of the computer.

Local bus — A data bus that provides a fast throughput for devices to the microprocessor.

LPT — Line print terminal — The designation for a parallel connection to a printer or other parallel device.

M

Mb — megabit — A measurement of memory chip capacity that equals 1024 KB.

Mbps — megabits per second — One million bits per second. This measurement is typically used for transmission speeds for networks and modems.

MB — megabyte — A measurement of data storage that equals 1,048,576 bytes. 1 MB equals 1024 KB. When used to refer to hard drive storage, the term is often rounded to mean 1,000,000 bytes.

MB/sec — megabytes per second — One million bytes per second. This measurement is typically used for data transfer ratings.

Memory — A temporary data storage area inside your computer. Because the data in memory is not permanent, Dell recommends that you frequently save your files while you are working on them, and always save your files before you shut down the computer. Your computer can contain several different forms of memory, such as RAM, ROM, and video memory. Frequently, the word memory is used as a synonym for RAM.

Memory address — A specific location where data is temporarily stored in RAM.

Memory mapping — The process by which the computer assigns memory addresses to physical locations at start-up. Devices and software can then identify information that the microprocessor can access.

MHz — megahertz — A measure of frequency that equals 1 million cycles per second. The speeds for computer microprocessors, buses, and interfaces are typically measured in MHz.

Microprocessor — A computer chip that interprets and executes program instructions. Sometimes the microprocessor is referred to as the processor or the CPU (central processing unit).

Modem — A device that allows your computer to communicate with other computers over analog telephone lines. Three types of modems include: external, PC Card, and internal. You typically use your modem to connect to the Internet and exchange e-mail.

Monitor — The high-resolution TV-like device that displays your computer's output.

Mouse — A pointing device that controls the movement of the cursor on your screen. Typically you roll the mouse along a hard, flat surface to move the pointer or cursor on your screen.

ms — millisecond — A measure of time that equals one thousandth of a second. Access times of storage devices are often measured in ms.

N

Network adapter — A chip that provides network capabilities. A computer may include a network adapter on its system board or it may contain a PC Card with an adapter on it. A network adapter is also referred to as a NIC (network interface controller).

NIC — See network adapter.

Notification area — The section of the Windows taskbar that contains icons for providing quick access to programs and computer functions, such as the clock, volume control, and print status. Also referred to as system tray.

ns — nanosecond — A measure of time that equals one billionth of a second.

NVRAM — nonvolatile random access memory — A type of memory that stores data when the computer is turned off or loses its external power source. NVRAM is used for maintaining computer configuration information such as date, time, and other system setup options that you can set.

P

Parallel connector — An I/O port often used to connect a parallel printer to your computer. Also referred to as an LPT port.

Partition — A physical storage area on a hard drive that is assigned to one or more logical storage areas known as logical drives. Each partition can contain multiple logical drives.

PCI — peripheral component interconnect — PCI is a local bus that supports 32-

and 64-bit data paths, providing a high-speed data path between the microprocessor and devices such as video, drives, and networks.

PIO — programmed input/output — A method of transferring data between two devices through the microprocessor as part of the data path.

Pixel — A single point on a display screen arranged in rows and columns to create an image. A video resolution, such as 800 x 600, is expressed as the number of pixels across by the number of pixels up and down.

Plug-and-Play — The ability of the computer to automatically configure devices. Plug and Play provides automatic installation, configuration, and compatibility with existing hardware if the BIOS, operating system, and all devices are Plug and Play compliant.

POST — power-on self-test — Diagnostics programs, loaded automatically by the BIOS, that perform basic tests on the major computer components, such as memory, hard drives, and video. If no problems are detected during POST, the computer continues the start-up.

Program — Any software that processes data for you, including spreadsheet, word processor, database, and game packages. Programs require an operating system to run.

PS/2 — personal system/2 — A type of connector for attaching a PS/2-compatible keyboard, mouse, or keypad.

PXE — pre-boot execution environment — A WfM (Wired for Management) standard that allows networked computers that do not have an operating system to be configured and started remotely.

R

RAID — redundant array of independent disks — A system of two or more drives working together for performance and fault tolerance. RAID drives are typically used on servers and high-end PCs.

The three most common RAID levels are 0, 3, and 5:

- **Level 0:** Provides data striping but no redundancy. Level 0 improves performance but does not provide fault tolerance.
- **Level 3:** Same as Level 0, but also reserves one dedicated drive for error correction data, providing good performance and some level of fault tolerance.
- **Level 5:** Provides data striping at the byte level and also stripe error correction information, resulting in excellent performance and good fault tolerance.

RAM — random-access memory — The primary temporary storage area for program instructions and data. Any information stored in RAM is lost when you turn off your computer.

Readme file — A text file included with a software package or hardware

product. Typically, readme files provide installation information and describe new product enhancements or corrections that have not yet been documented.

READ-ONLY — Data and/or files you can view but cannot edit or delete. A file can have read-only status if:

- It resides on a physically write-protected floppy disk.
- It is located on a network in a directory and the system administrator has assigned rights only to specific individuals.

REFRESH RATE — The frequency, measured in Hz, at which your screen's horizontal lines are recharged (sometimes also referred to as its vertical frequency). The higher the refresh rate, the less video flicker can be seen by the human eye.

RESOLUTION — The sharpness and clarity of an image produced by a printer or displayed on a monitor. The higher the resolution, the sharper the image.

RFI — radio frequency interference — Interference that is generated at typical radio frequencies, in the range of 10 kHz to 100,000 MHz. Radio frequencies are at the lower end of the electromagnetic frequency spectrum and are more likely to have interference than the higher frequency radiations such as infrared and light.

ROM — read-only memory — Memory that stores data and programs that cannot be deleted or written to by the computer. ROM, unlike RAM, retains its contents after you turn off your computer. Some programs essential to the operation of your computer reside in ROM.

RPM — revolutions per minute — The number of rotations that occur per minute.

RTC — real time clock — Battery-powered clock on the system board that keeps the date and time after you turn off the computer.

RTCRST — real time clock reset — A jumper on the system board that can often be used for troubleshooting problems.

S

SCANDISK — A Microsoft utility that checks files, folders, and the hard drive's surface for errors. ScanDisk often runs after a lockup occurs.

SDRAM — synchronous dynamic random-access memory — A type of DRAM that is synchronized with the optimal clock speed of the microprocessor.

SERIAL CONNECTOR — An I/O port often used to connect devices such as a handheld digital device or digital camera to your computer.

SERVICE TAG — A bar code label on your computer that identifies your computer when you access Dell Support at **support.dell.com** or when you call Dell for customer or technical support.

SETUP PROGRAM — A program that is used to install and configure hardware and software. The **setup.exe** or **install.exe** program comes with most Windows

software packages. Setup program differs from system setup program.

SHORTCUT — An icon that provides quick access to frequently used programs, files, folders, and drives. When you place a shortcut on your Windows desktop and double-click the icon, you can open its corresponding folder or file without having to find it first. Shortcut icons do not change the location of files. If you delete a shortcut, the original file is not affected. Also, you can rename a shortcut icon.

SHUTDOWN — The process of closing windows and programs, exiting the operating system, and turning off your computer. You can lose data if you turn off your computer before completing a shutdown.

SOFTWARE — Anything that can be stored electronically, such as computer files or programs.

STANDBY MODE — A power management mode that shuts down all unnecessary computer operations to save energy.

SURGE PROTECTORS — Prevents voltage spikes, such as those that may occur during an electrical storm, from entering the computer through the electrical outlet. They do not protect against lightning strikes or against brownouts, which occur when the voltage drops more than 20 percent below the normal AC line voltage level.

Network connections cannot be protected by surge protectors. Always disconnect the network cable from the network connector during electrical storms.

SYSTEM BOARD — The main circuit board in your computer. Also known as the motherboard.

SYSTEM SETUP PROGRAM — A utility that serves as an interface between the computer hardware and the operating system. System setup allows you to configure user-selectable options in the BIOS such as date and time or system password. Unless you understand what effect the settings have on the computer, do not change the settings for this program.

SYSTEM TRAY — The section of the Windows taskbar that contains icons for providing quick access to programs and computer functions, such as the clock, volume control, and print status. Also referred to as notification area.

T

TAPI — telephony application programming interface — Enables Microsoft Windows program applications to operate with a wide variety of telephony devices, including voice, data, fax, video, and so on.

TEXT EDITOR — A program used to create and edit files that contain only text; for example, Windows Notepad uses a text editor. Text editors do not usually provide word wrap or formatting functionality (the option to underline, change fonts, and so on).

U

UPS — uninterruptible power supply — A backup power source used when the electrical power fails or drops to an unacceptable voltage level. A UPS keeps a computer running for a limited amount of time when there is no electrical power. UPS systems typically provide surge suppression and may also provide voltage regulation. Small UPS systems provide battery power for a few minutes to enable you to shut down your computer.

USB — universal serial bus — A hardware interface for a low-speed device such as a USB-compatible keyboard, mouse, joystick, scanner, set of speakers, or printer. Devices are plugged directly into a 4-pin socket on your computer or into a multi-port hub that plugs into your computer. USB devices can be connected and disconnected while the computer is turned on, and they can also be daisy-chained together.

UTP — unshielded twisted pair — a type of cable that consists of two unshielded wires twisted around each other. These cables are used for LANs and telephone connections.

V

VIDEO CONTROLLER — The circuitry on a video card or on the system board (in computers with an integrated video controller) that provides the video capabilities—in combination with the monitor—for your computer.

VIDEO MEMORY — Memory that consists of memory chips dedicated to video functions. Video memory is usually faster than system memory. The amount of video memory installed primarily influences the number of colors that a program can display.

VIDEO MODE — A mode that describes how text and graphics are displayed on a monitor. Graphics-based software, such as the Windows operating system, displays in video modes that can be defined as *x* horizontal pixels by *y* vertical pixels by *z* colors. Character-based software, such as text editors, displays in video modes that can be defined as *x* columns by *y* rows of characters.

VIDEO RESOLUTION — See resolution.

VIRUS — A program that is designed to inconvenience you or to destroy data stored on your computer. A virus program moves from one computer to another via an infected disk, software downloaded from the Internet, or e-mail attachments. When an infected program starts, its embedded virus also starts.

A common type of virus is a boot virus, which is stored in the boot sectors of a floppy disk. If the floppy disk is left in the drive when the computer is shut down and then turned on, the computer is infected when it reads the boot sectors of the floppy disk expecting to find the operating system. If the computer is infected, the boot virus may replicate itself onto all of the floppy disks that are read or written in that

computer until the virus is eradicated.

V — volt — The measurement of electric potential or electromotive force. One V appears across a resistance of 1 ohm when a current of 1 ampere flows through that resistance.

W

W — watt — The measurement of electrical power. One W is 1 ampere of current flowing at 1 volt.

WHR — watt-hour — A unit of measure commonly used to indicate the approximate capacity of a battery. For example, a 66 WHr battery can supply 66 W of power for 1 hour or 33 W for 2 hours.

WALLPAPER — The background pattern or picture on the Windows desktop. Change your wallpaper through the Windows Control Panel. You can also scan in your favorite picture and make it wallpaper.

WRITE-PROTECTED — Files or media that cannot be changed. Use write-protection when you want to protect data from being changed or destroyed. To write-protect a 3.5-inch floppy disk, slide its write-protect tab to the open position.

Z

ZIF — zero insertion force — A type of socket or connector that allows a computer chip to be installed or removed with no stress applied to either the chip or its socket.

ZIP — A popular data compression format. Files that have been compressed with the Zip format are called Zip files and usually have a filename extension of **.zip**. A special kind of zipped file is a self-extracting file, which has a filename extension of **.exe**. You can unzip a self-extracting file by double-clicking it.

ZIP DRIVE — A high-capacity floppy drive developed by Iomega Corporation that uses 3.5-inch removable disks called Zip disks. Zip disks are slightly larger than regular floppy disks, about twice as thick, and they hold up to 100 MB of data.